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TRANSACTIONS

OF THE

COLLEGE OF PHYSICIANS

OF PHILADELPHIA.

VOLUME THE EIGHTH.

TRANSACTIONS

OF THE

COLLEGE OF PHYSICIANS

OF

PHILADELPHIA.

THIRD SERIES.

VOLUME THE FIRST.

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1875.

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LIST

OF THE

PRESIDENTS OF THE COLLEGE FROM THE TIME OF ITS INSTITUTION.

ELECTED

1787. JOHN REDMAN, M.D.
1805. WILLIAM SHIPPEN, M.D.
1809. ADAM KUHN, M.D.
1818. THOMAS PARKE, M.D.
1835. THOMAS C. JAMES, M.D.*
1835. THOMAS T. HEWSON, M.D.
1848. GEORGE B. WOOD, M.D., LL.D.

* Died four months after his election.

FELLOWS

OF THE

COLLEGE OF PHYSICIANS OF PHILADELPHIA.

JUNE, 1875.

[Non-Resident Fellows are marked thus (*).]

ELECTED

1870. Adler, John M., M.D.

1859. Agnew, D. Hayes, M.D., LL.D., Professor of Surgery in the University of Pennsylvania, Consulting Surgeon to the Presbyterian Hospital and to the Orthopædic Hospital, and to the Philadelphia and Northern Dispensaries.

1867. Allen, Harrison, M.D., Professor of Comparative Anatomy and Zoölogy in the University of Pennsylvania, Surgeon to the Philadelphia Hospital and to St. Joseph's Hospital.

1873. Allis, Oscar H., M.D., Surgeon to the Presbyterian Hospital and to the Howard Hospital.

1869. Andrews, T. Hollingsworth, M.D., Demonstrator of Anatomy in the Jefferson Medical College, Surgeon for Out-Patients to the Pennsylvania Hospital, Surgeon to the Howard Hospital, Consulting Surgeon to the Hospital of the Good Shepherd, Radnor.

1872. Ashbridge, William, M.D., Physician to the German Hospital, Surgeon for Out-patients to the Pennsylvania Hospital.

1863. Ashhurst, John, Jr., M.D., Surgeon to the Episcopal Hospital and to the Children's Hospital, Consulting Surgeon to the Hospital of the Good Shepherd, Radnor.

1865. Ashhurst, Samuel, M.D., Surgeon to the Episcopal Hospital.

ELECTED

1835. Ashmead, William, M.D.

1857. Atlee, Walter F., M.D.

1846. Atlee, Washington L., M.D.

1852. Bache, Thomas Hewson, M.D.

1873. Baxter, H. F., M.D.

1874. Beecher, A. C. W., M.D.

1860. Benner, Henry D., M.D.

1874. Bennett, W. H., M.D., Assistant Physician to the Episcopal Hospital.

1871. Bertolet, R. M., M.D., Physician to the German Hospital, Microscopist to the Philadelphia Hospital.

1851. Biddle, John B., M.D., Professor of Materia Medica and General Therapeutics in the Jefferson Medical College.

*1866. Black, J. J., M.D.

*1867. Boardman, Charles H., M.D.

1859. Boker, Charles S., M.D., Surgeon to St. Joseph's Hospital.

1864. Bolling, Robert, M.D.

1842. Bridges, Robert, M.D., Professor of Chemistry in the Philadelphia College of Pharmacy.

1856. Brinton, John H., M.D., Lecturer on Operative Surgery in the Jefferson Medical College, Surgeon to the Philadelphia Hospital and to St. Joseph's Hospital.

*1851. Bullock, William R., M.D.

1870. Burnett, C. H., M.D., Aurist to the Presbyterian Hospital, Surgeon to the Philadelphia Infirmary for Diseases of the Ear.

1863. Burpee, David, M.D., Physician to the Howard Hospital.

1838. Carson, Joseph, M.D., Professor of Materia Medica and Pharmacy in the University of Pennsylvania.

1868. Cheston, D. Murray, M.D., Physician to the Children's Hospital.

1873. Clark, Leonardo S., M.D., Physician to the Charity Hospital.

ELECTED

1872. Cleemann, Richard A., M.D., Physician to St. Mary's Hospital.

*1842. Clymer, Meredith, M.D.

1827. Coates, Benjamin Hornor, M.D.

1871. Cohen, J. Solis, M.D., Lecturer on Laryngoscopy and Diseases of the Throat and Chest in the Jefferson Medical College.

*1870. Corbit, William B., M.D.

*1857. Corse, James M., M.D.

1866. Cruice, R. B., M.D., House Surgeon to St. Joseph's Hospital.

1873. Cruice, W. R., M.D.

1868. Cummiskey, James, M.D., Physician to St. Mary's Hospital.

1858. DaCosta, J. M., M.D., Professor of the Principles and Practice of Medicine in the Jefferson Medical College, Physician to the Pennsylvania Hospital, Consulting Physician to the Presbyterian Hospital and to the Children's Hospital, and to the Northern Dispensary.

1859. Darrach, James, M.D., Consulting Surgeon to the Germantown Hospital.

1866. Darrach, William, M.D., Physician to the Germantown Hospital.

1874. Deakyne, A. C., M.D.

*1870. Deal, L. J., M.D.

1864. Downs, R. N., M.D., Consulting Physician to the Germantown Hospital.

1864. Duer, E. L., M.D., Accoucheur to the Philadelphia Hospital, Surgeon to the State Hospital for Women and Infants, Visiting Physician to the Preston Retreat.

1871. Duhring, L. A., M.D., Clinical Professor of Skin Diseases in the Hospital of the University of Pennsylvania, Physician to the Dispensary for Skin Diseases.

1863. Dunglison, Richard J., M.D.

*1871. Dunglison, Thomas R., M.D.

ELECTED

*1849. Dunott, Justus, M.D.

1860. Dunton, William R., M.D., Consulting Physician to the Germantown Hospital.

1842. Evans, Charles, M.D.

1868. Evans, H. Y., M.D., Physician to the Charity Hospital.

1872. Finn, W. H., M.D., Assistant Surgeon to the Episcopal Hospital.

1866. Fischer, Emil, M.D.

1862. Forbes, William S., M.D., Surgeon to the Episcopal Hospital.

1870. Ford, W. H., M.D.

1831. Fox, George, M.D.

1864. Fricke, Albert, M.D.

1870. Gardette, E. B., M.D.

1873. Gerhard, George S., M.D., Assistant Physician to the Children's Hospital and to the Orthopædic Hospital, Physician for Out-Patients to the Presbyterian Hospital.

1864. Getchell, F. H., M.D., Clinical Lecturer on Obstetrics and Diseases of Women in the Jefferson Medical College, Obstetric Physician to the Catherine Street Dispensary.

*1846. Gibbons, Henry, M.D.

1863. Gilbert, W. Kent, M.D.

*1848. Given, Robert A., M.D.

*1854. Gobrecht, William H., M.D.

1868. Goodell, William, M.D., Clinical Professor of Diseases of Women and Children in the Hospital of the University of Pennsylvania, Physician in charge of the Preston Retreat, Consulting Physician to the Lying-in Department of the Northern Dispensary.

1867. Goodman, H. Earnest, M.D., Surgeon to Wills Hospital and to the Orthopædic Hospital, Consulting Surgeon to the State Hospital for Women and Infants.

1864. Granger, William H., M.D.

1857. Green, Alfred, M.D.

ELECTED

1870. Grier, M. J., M.D.

1821. Griffiths, Elijah, M.D.

1842. Griscom, John D., M.D.

1857. Gross, Samuel D., M.D., LL.D., D.C.L. Oxon., Professor of the Principles and Practice of Surgery in the Jefferson Medical College, Consulting Surgeon to the Orthopædic Hospital.

1868. Gross, Samuel W., M.D., Surgeon to the Philadelphia Hospital, Consulting Surgeon to the Northern Dispensary.

1871. Grove, John H., M.D., Surgeon to St. Mary's Hospital.

1863. Hall, A. Douglass, M.D., Surgeon to Wills Hospital, Ophthalmic Surgeon to St. Mary's Hospital.

1865. Hamilton, George, M.D.

*1859. Hammond, William A., M.D.

1869. Hare, H. B., M.D., Physician to the Episcopal Hospital, Pathological Chemist to the Pennsylvania Hospital.

1865. Harlan, George C., M.D., Surgeon to Wills Hospital, Ophthalmic and Aural Surgeon to the Children's Hospital.

1863. Harlow, Lewis D., M.D.

1862. Harris, Robert P., M.D., Physician to the Franklin Reformatory Home.

1847. Hartshorne, Edward, M.D.

*1851. Hartshorne, Henry, M.D.

1868. Hassler, Ferdinand A., M.D.

*1849. Hastings, John, M.D.

1855. Hatfield, Nathan L., M.D., Consulting Physician to the Northern Dispensary.

*1865. Hayes, Isaac I., M.D.

1835. Hays, Isaac, M.D.

1872. Hays, I. Minis, M.D.

1853. Hewson, Addinell, M.D., Surgeon to the Pennsylvania Hospital.

1872. Hinkle, A. G. B., M.D.

ELECTED

1863. Hodge, H. Lenox, M.D., Demonstrator of Anatomy in the University of Pennsylvania, Surgeon to the Presbyterian Hospital and to the Children's Hospital, Consulting Physician to the Lying-in Department of the Northern Dispensary.

1852. Hooper, William H., M.D.

1867. Horn, George H., M.D.

1868. Howell, Samuel B., M.D., Professor of Mineralogy and Geology in the University of Pennsylvania.

1854. Hunt, William, M.D., Surgeon to the Pennsylvania Hospital, Consulting Surgeon to the Orthopædic Hospital.

1871. Hunter, Charles T., M.D., Demonstrator of Surgery in the University of Pennsylvania, Surgeon for Out-patients to the Pennsylvania Hospital.

1863. Hutchinson, James H., M.D., Physician to the Pennsylvania Hospital and to the Children's Hospital.

1871. Ingham, James V., M.D., Obstetrician to the State Hospital for Women and Infants.

1871. Jenks, William F., M.D., Surgeon to the State Hospital for Women and Infants, Consulting Physician to the Lying-in Department of the Northern Dispensary.

1864. Jones, S. P., M.D., Assistant Physician to the Pennsylvania Hospital for the Insane.

1867. Judson, Oliver A., M.D.

1849. Keating, William V., M.D., Physician to St. Joseph's Hospital.

1867. Keen, William W., M.D., Lecturer on Pathological Anatomy in the Jefferson Medical College, Surgeon to St. Mary's Hospital.

1852. Kennedy, Alfred L., M.D.

*1844. King, Charles R., M.D.

1864. King, William M., M.D., U. S. N.

1839. Kirkbride, Thomas S., M.D., Physician-in-Chief to the Pennsylvania Hospital for the Insane.

1848. Klapp, Joseph, M.D., Physician to the Howard Hospital.

ELECTED

*1865. LaRoche, C. Percy, M.D.

1868. Leavitt, Thaddeus L., M.D., Physician to the German town Hospital.

1864. LeConte, John L., M.D.

1864. Leedom, John M., M.D.

1851. Leidy, Joseph, M.D., LL.D., Professor of Anatomy in the University of Pennsylvania.

1855. Lewis, Francis W., M.D.

1849. Lewis, Samuel, M.D.

1836. Littell, S., M.D., Consulting Surgeon to the Philadelphia Dispensary.

1864. Livezey. Edward, M.D., Consulting Surgeon to the Northern Dispensary.

*1847. Logan, J. Dickinson, M.D.

1849. Ludlow, John L., M.D., Physician to the Philadelphia Hospital, Consulting Physician to the Presbyterian Hospital.

1871. McFerran, J. A., M.D., Physician to the Gynæcological Hospital and Infirmary for Diseases of Children.

1866. Maury, F. F., M.D., Lecturer on Venereal and Cutaneous Diseases in the Jefferson Medical College, Surgeon to the Philadelphia Hospital, Consulting Surgeon to the State Hospital for Women and Infants.

*1850. Mayer, Edward H., M.D.

1868. Mears, J. Ewing, M.D., Demonstrator of Surgery in the Jefferson Medical College, Surgeon to St. Mary's Hospital.

1875. Meigs, Arthur V., M.D., Assistant Physician to the Children's Hospital.

1856. Meigs, James Aitken, M.D., Professor of the Institutes of Medicine and of Medical Jurisprudence in the Jefferson Medical College, Physician to the Pennsylvania Hospital.

1843. Meigs, John Forsyth, M.D., Physician to the Pennsylvania Hospital, Consulting Physician to the Children's Hospital.

ELECTED

1856. Mitchell, S. Weir, M.D., Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases, Consulting Physician to the State Hospital for Women and Infants.

1842. Moehring, Gotthilf, M.D.

1863. Morehouse, George R., M.D., Physician to St. Joseph's Hospital.

1839. Morris, Caspar, M.D.

1856. Morris, J. Cheston, M.D.

1861. Morton, Thomas G., M.D., Surgeon to the Pennsylvania Hospital, to the Orthopædic Hospital, and to the Jewish Hospital.

1864. Moss, William, M.D.

1865. Nebinger, Andrew, M.D.

1846. Neill, John, M.D., Clinical Professor of Surgery in the Hospital of the University of Pennsylvania, Consulting Surgeon to the Presbyterian Hospital.

1869. Norris, Herbert, M.D., Physician to the Episcopal Hospital and to the Catharine Street Dispensary.

1865. Norris, Isaac, Jr., M.D.

1870. Norris, John C., M.D.

1866. Norris, William F., M.D., Clinical Professor of Diseases of the Eye in the Hospital of the University of Pennsylvania, Surgeon to Wills Hospital.

1858. Packard, John H., M.D., Surgeon to the Episcopal Hospital.

1863. Page, Edward A., M.D., Surgeon to St. Joseph's Hospital.

1843. Page, William Byrd, M.D.

1835. Pancoast, Joseph, M.D., Emeritus Professor of General, Descriptive, and Surgical Anatomy in the Jefferson Medical College.

1864. Pancoast, William H., M.D., Professor of General, Descriptive, and Surgical Anatomy in the Jefferson Medical College, Surgeon to the Philadelphia Hospital, Consulting Surgeon to the Charity Hospital.

ELECTED

*1854. Parrish, Joseph, M.D.

1869. Parry, John S., M.D., Accoucheur to the Philadelphia Hospital, Physician for Diseases Peculiar to Women to the Presbyterian Hospital, Surgeon to the State Hospital for Women and Infants.

*1835. Paul, John Marshall, M.D.

1836. Paul, John Rodman, M.D.

1839. Peace, Edward, M.D.

1854. Penrose, R. A. F., M.D., LL.D., Professor of Obstetrics and Diseases of Women and Children in the University of Pennsylvania, Consulting Obstetrician to the State Hospital for Women and Infants, Visiting Physician to the Preston Retreat.

1868. Pepper, William, M.D., Clinical Professor of Medicine in the Hospital of the University of Pennsylvania, Physician to the Philadelphia Hospital and to the Children's Hospital.

1872. Porter, William G., M.D., Surgeon to the Presbyterian Hospital.

1853. Rand, B. Howard, M.D., Professor of Chemistry in the Jefferson Medical College.

1868. Ray, Isaac, M.D.

1866. Reed, Thomas B., M.D., Surgeon to the Presbyterian Hospital.

1849. Reed, Thomas S., M.D.

1842. Reese, John J., M.D., Professor of Medical Jurisprudence in the University of Pennsylvania, Physician to St. Joseph's Hospital, and to the Gynæcological Hospital and Infirmary for Diseases of Children.

1853. Rhoads, James E., M.D.

1871. Richardson, Elliott, M.D., Surgeon for Out-patients to the Pennsylvania Hospital, Obstetric Physician to the Philadelphia Dispensary, Physician to the Catharine Street Dispensary.

1869. Richardson, Joseph G., M.D., Physician for Out-patients and Microscopist to the Pennsylvania Hospital.

ELECTED

*1857. Richardson, Thomas G., M.D.

1867. Roberts, Jacob, M.D.

1843. Rodman, Lewis, M.D., Visiting Physician to the Preston Retreat.

1857. Rogers, Robert E., M.D., Professor of Chemistry in the University of Pennsylvania.

1838. Ruschenberger, W. S. W., M.D., U. S. N.

*1852. Sargent, Fitz William, M.D.

1864. Sargent, Winthrop, M.D.

1866. Schaffer, Charles, M.D.

1870. Schell, Henry S., M.D., Surgeon to St. Mary's Hospital.

1875. Seyfert, Theodore F., M.D., Physician to the Gynæcological Hospital and Infirmary for Diseases of Children.

1868. Shapleigh, E. B., M.D.

1870. Silliman, Henry R., M.D.

1873. Simpson, James, M.D.

1872. Sinkler, Wharton, M.D., Physician to the Episcopal Hospital, and to the Orthopædic Hospital and Infirmary for Nervous Diseases.

1857. Slocum, Alfred M., M.D.

1863. Smith, Albert H., M.D., Physician to and Lecturer on Obstetrics in the Philadelphia Lying-in Charity, Visiting Physician to the Preston Retreat, Consulting Physician to the Hospital of the Good Shepherd, Radnor.

1863. Smith, A. K., M.D., U. S. A.

1864. Smith, Edward A., M.D.

1845. Smith, F. G., Jr., M.D., Professor of the Institutes of Medicine in the University of Pennsylvania.

*1856. Smith, R. K., M.D.

1870. Smyth, Francis G., M.D.

1864. Spooner, Edward A., M.D.

1875. Starr, Louis, M.D., Assistant Physician to the Episcopal Hospital and to the Children's Hospital.

1835. Stewardson, Thomas, M.D.

ELECTED

1842. Stillé, Alfred, M.D., Professor of the Theory and Practice of Medicine in the University of Pennsylvania, Physician to St. Joseph's Hospital, Consulting Physician to the State Hospital for Women and Infants.

1846. Stocker, Anthony E., M.D.

1871. Strawbridge, George, M.D., Clinical Professor of Diseases of the Ear in the Hospital of the University of Pennsylvania, Surgeon to Wills Hospital, Ophthalmic Surgeon to the Presbyterian Hospital, Surgeon to the Eye and Ear Department of the Philadelphia Dispensary.

1855. Stroud, William D., M.D.

1867. Taylor, R. R., M.D.

1867. Thomas, Charles H., M.D.

1873. Thomas, Richard, M.D.

1869. Thomson, William, M.D., Lecturer on Ophthalmic and Aural Surgery in the Jefferson Medical College, Surgeon to Wills Hospital.

1852. Tiedemann, Henry, M.D.

*1853. Tilden, W. P., M.D.

1870. Townsend, Ralph M., M.D., Lecturer on Minor Surgery in the Jefferson Medical College.

1850. Townsend, Richard H., M.D.

1870. Turner, A. Paul, M.D., Physician to the Howard Hospital.

1866. Tyson, James, M.D., Clinical Professor of Pathological Anatomy and Histology in the Hospital of the University of Pennsylvania, Physician to the Philadelphia Hospital.

*1852. Tyson, James L., M.D.

1864. Vandyke, E. B., M.D.

1873. Van Harlingen, Arthur, M.D., Assistant Physician to the Dispensary for Skin Diseases.

1852. Wallace, Ellerslie, M.D., Professor of Obstetrics and Diseases of Women and Children in the Jefferson Medical College, Consulting Obstetrician to the State Hospital for Women and Infants, Visiting Physician to the Preston Retreat, Consulting Physician to the Lying-in Department of the Northern Dispensary.

ELECTED

1873. Wallace, W. H., M.D.

*1839. Warrington, Joseph, M.D.

1875. Webb, William H., M.D.

1863. Wells, W. Lehman, M.D.

1864. West, Hilborne, M.D., Physician to the Children's Hospital.

1868. Williams, Horace, M.D., Obstetrician to the State Hospital for Women and Infants, Obstetric Physician to the Philadelphia Dispensary, Physician to the Howard Hospital.

1851. Wilson, Ellwood, M.D., Consulting Physician to the Philadelphia Lying-in Charity, Visiting Physician to the Preston Retreat.

1874. Wilson, J. C., M.D., Assistant Physician to the Children's Hospital.

1871. Wistar, Thomas, M.D.

1848. Wister, Caspar, M.D., Consulting Physician to the Philadelphia Dispensary.

1852. Wister, Owen Jones, M.D.

1827. Wood, George B., M.D., LL.D., Emeritus Professor of the Theory and Practice of Medicine in the University of Pennsylvania.

1865. Wood, Horatio C., Jr., M.D., Professor of Botany in the University of Pennsylvania and Clinical Professor of Diseases of the Nervous System in the Hospital of the same, Physician to the Philadelphia Hospital.

1866. Woods, D. F., M.D., Physician to the Presbyterian Hospital.

1860. Wurts, Charles Stewart, M.D.

1868. Yarrow, Thomas J., M.D.

*1840. Zantzinger, William S., M.D.

[It is particularly requested that any change of Appointment, etc., may be communicated to the Committee of Publication before the first of June, in each year, in order that the List may be made as correct as possible.]

ASSOCIATES.

[Limited to Fifty, of whom Twenty may be Foreigners.]

ELECTED

1873. Acland, Henry W., M.D., F.R.S., Oxford, England.
1869. Alvarenga, P. F. Da Costa, Lisbon, Portugal.
1846. Arnold, Richard D., M.D., Savannah, Georgia.
1847. Atlee, John L., M.D., Lancaster, Pennsylvania.
1821. Bigelow, Jacob, M.D., Boston, Massachusetts.
1872. Boeck, W., M.D., Christiania, Norway.
1865. Butcher, R. G. H., M.D., Dublin, Ireland.
1848. Christison, Sir Robert, Bart., M.D., D.C.L., LL.D., Edinburgh, Scotland.
1853. Churchill, Fleetwood, M.D., Dublin, Ireland.
1868. Flint, Austin, M.D., New York.
1857. Gintrac, E., Bordeaux, France.
1852. Hall, Archibald, M.D., Canada.
1868. Hamilton, Frank H., M.D., LL.D., New York.
1874. Jackson, J. Hughlings, M.D., London, England.
1854. Lever, John M., M.D., London, England.
1865. Macleod, G. H. B., M.D., Edinburgh, Scotland.
1873. Ogle, John W., M.D., London, England.
1874. Paget, Sir James, Bart., D.C.L., F.R.S., London, England.
1842. Parker, Peter, M.D., China.
1873. Peacock, Thomas B., M.D., London, England.

ELECTED

1842. Smith, Nathan R., M.D., Baltimore, Maryland.

1869. Valcourt, Th. de, Cannes, France.

1857. Valery, Gaetano, Florence, Italy.

1861. Velasco, Pedro Gonzales, Madrid, Spain.

1860. Walther, Hermann, Dresden, Saxony.

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NOTICE.

The College of Physicians of Philadelphia issued part of a volume of Transactions in the year 1793, but the publication was discontinued, and was not resumed until the year 1842.

The First Series of the Transactions, or "Summary of the Transactions," embraced the proceedings of the College from November, 1841, to October, 1849, and formed three volumes.

The Second Series extended from November, 1850, to February, 1874, and formed four volumes. From August, 1857, to February, 1874, the Transactions appeared first in the pages of the American Journal of the Medical Sciences.

The present volume, which begins the Third Series, contains the papers read before the College from April, 1874, to June, 1875, inclusive.

The Committee of Publication thinks it proper to say that the College holds itself in no way responsible for the statements, reasonings, or opinions set forth in the various papers published in its Transactions.

AUTOPSY OF THE SIAMESE TWINS.

Fig. 1.

Fig. 1. The twins in the acquired position (E. R., C. L.). From a photograph taken in St. Petersburg, 1870.

NOTE.

The word "Report" used in the title of my paper is to be read as referring to the post-mortem appearances only, and not to the Report of the Commission as appointed by the College. The ante-mortem history prefixed to my paper was written in conjunction with Prof. Pancoast.

H. ALLEN.

REPORT

OF AN

AUTOPSY ON THE BODIES OF CHANG AND ENG BUNKER, COMMONLY KNOWN AS THE SIAMESE TWINS.

By

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[Read April 1, 1874.]

ANTE-MORTEM HISTORY.

Chang and Eng Bunker were born near Bangkok, Siam, in 1811, their father being a Chinaman, their mother a native of Siam, bred by a Chinese father.[1]

The twins were united by a band extending from the junction of the abdominal and thoracic cavities, anteriorly, constituting the variety in teratology known as *Omphalopagus xiphodidymus*.

They were married in April, 1843, and raised large families; Chang having had ten, and Eng twelve children. Chang had three boys and seven girls; Eng had seven boys and five girls. These were in all respects average children, excepting two, a boy and girl of Chang's, who were deaf-mutes.

The twins resided in a rolling country, about four miles from Mount Airy, Surrey Co., N. C. They were prosperous farmers, each owning his own farm. The

[1] For this statement see an article in Lippincott's Magazine, March, 1874.

dwellings of the two families were a mile and a half apart. The twins resided three days in each of the homes alternately. They were expert in the handling of tools, in plowing, shingling, shooting, etc. They lived much in the open air, and frequently drove in a carriage to the neighboring village.

The events leading to their death were as follows: About six years ago Chang, who had always been the more excitable, became addicted to immoderate drinking. Three years ago, while on a voyage from Liverpool to New York, he was stricken with hemiplegia of the right side. He in great measure recovered from this attack, but could never ascend and descend stairs with facility. For this reason the twins occupied rooms on the ground floors of their homes.

On Monday evening, Jan. 12th, 1874, Chang was seized, while at his own house, with an attack of bronchitis. He had a cough; scanty, frothy sputa; but no pain. On Wednesday the symptoms had somewhat subsided; the skin was acting freely. Loud bronchial râles were present over the left side of the chest. On Thursday evening the twins insisted upon leaving Chang's house for Eng's. The weather was very cold, and the journey was undertaken in an open carriage. On their arrival, however, Chang continued as well as before, until Friday evening, when he complained of thoracic oppression and inability to lie down with comfort. After having retired that evening, the twins were heard to get up, and go out on the porch, by the side of the house, where they drank of water, and returned to their room. They built a large wood fire, and sat down; Eng soon complaining of being sleepy, Chang declaring that he could not breathe if he should lie down. Finally

they again retired. They both fell asleep. Near daybreak (Jan. 17th) Eng called to one of his sons, who slept in a room above, to come down and waken Chang. The boy soon made his appearance, and going to the side of Chang, cried out, "Uncle Chang is dead!" Eng at once said "Then I am going!"—It is probable that Chang was sleeping when he died.

Eng made no further mention of Chang other than to request that the body be moved closer to him. Soon afterward Eng desired to have his limbs moved. This desire continued for half an hour. He then asked for a urinal, but did not void over a few drops of urine. He several times repeated the endeavor to micturate, but without success. He then complained of a choking sensation, and asked to be raised in bed. He had continued rational. His last words were "May God have mercy on my soul!" He gradually became fainter, fell into a syncopal state, and died quietly a little over two hours from the announcement to him of the death of his brother.

AUTOPSY.

The AUTOPSY was begun in the house of Eng, Sunday, February 1st, 1874, and finished in the Mütter Museum of the College of Physicians, at Philadelphia.

Age of subjects, 63 years. Examination made about fifteen days and eight hours after death. The weather had been cold. No preservative had been employed prior to the date of the autopsy.

I. Post-mortem Appearances.

The following is their description in Chang.

Body moderately emaciated. *Rigor mortis* none. The fingers of the right hand were semi-flexed, a condition due doubtless to the long-standing paralysis of the right upper extremity. Passive congestion was marked over entire dorsal aspect of the neck, trunk, and upper extremities. It was less marked over the corresponding surfaces of the forearm and legs. The feet and hands were almost entirely free. The superficial veins in the last-named localities, especially in the left foot, were distended. The passive congestion extended over the right thoracic region as far as the median line, and on the front of both thighs, especially the right. Upon the head the congestion was seen behind and beneath the ears, and was sparsely distributed over both malar prominences. The lips were discolored. The integument of the genitals was infiltrated, the scrotum particularly being much swollen. There was extensive greenish discoloration on the anterior abdominal wall. The left external abdominal ring was enlarged. Both testicles were within the scrotum. The hair of the head was gray. That on the right side of the pubis was black, that on the left was of an iron-gray color.

The following is their description in Eng.

Body moderately well nourished, spare. *Rigor mortis* slight. Passive congestion less marked than in Chang. It was most conspicuous on the buttocks and infraspinous spaces. There was none in front of the body. The testicle of left side absent from scrotum. There was moderate greenish discoloration of anterior

wall of abdomen. The hair on the pubis was black on the right side, pure gray on left side of the median line.

Measurements.—Chang was 5 ft. $2\frac{1}{2}$ in. in height; Eng, 5 ft. $3\frac{1}{2}$ in. When the bodies were laid upon a table Chang's left side and Eng's right side were drawn somewhat toward one another. This was most marked in Chang, and gave a greater inclination of his trunk toward his brother's. (See Figs. 1 and 19.)

II. External Appearances of the Band.

When the bodies were suspended and placed face to face, it was evident that the congenital position had been secured. All observations were made, as far as was possible, with the bodies in this position. With it the details of structure, it was thought, could be easily understood; without it the subject would be difficult and confused.

The "band" was a massive commissure placed between the bodies at the junction of the abdominal and thoracic regions of each. It was broader above than below, and had a circumference of nine inches. It presented four surfaces for examination, an upper, lower, and two lateral surfaces.

The *upper* surface was somewhat flattened in both Chang and Eng. The ensiform cartilage of each body could be felt deflected from the sternum and prolonged into the band. The base of the cartilage in Eng presented a rounded circular eminence, measuring one inch in diameter. There was no corresponding eminence in Chang. The upper aspect of each process could be well defined beneath the skin, the subcutaneous connective tissue being more abun-

dant in Chang than in Eng. The upper surface measured $2\frac{1}{2}$ in. in width at its base towards Eng, and $2\frac{1}{3}$ in. at its base towards Chang. It was 2 in. wide at its middle.

FIG. 2.

FIG. 2. The twins in the acquired position (E. R., C. L.), showing band and the primary incisions, *a–b*, *c–d*. From a photograph taken after death at Philadelphia.

The *lower* surface was much narrower than the upper. It was marked in the centre, but nearer the anterior than the posterior border, by a linear scar one inch in length, which it was thought answered to the position of the single umbilicus. The skin was adherent at this point, but elsewhere was easily raised in folds. Behind the scar, *i. e.*, toward the posterior part of the band, the

skin was somewhat corrugated. This portion answered, in position, to Chang's umbilical pouch.

The *lateral* surfaces. The terms *upper* surface and *lower* surface have fixed values, no matter how they may be approached by the observer. This is not the case, however, with the lateral surfaces, as will appear from the following considerations. Viewing the band as a separate form—as it was spoken of during the life of the twins—we will see that the terms front ("anterior") and back ("posterior"), as given to the lateral surfaces, were derived from studying the acquired position. Thus we were bound not to cut the "front" of the band, but allowed to make an incision on the "back." Now this position of selection was destroyed, and its terms deprived of what meaning they may have had, by the reproduction of the congenital relations of the bodies.

There is no doubt that in infancy and early childhood there was no acquired position, and, therefore, neither "front" nor "back" to the band. And later, when, as we have reason to believe, the position of selection was gradually adopted, the terms "front" and "back" were reversible—the "front" meaning that which corresponded to the surface of least thoracic approximation. Thus when the adult condition was fixed, and the "front" answered to the widely separated right side of Eng's chest and left side of Chang's chest, the "back" was in relation with the closely approximated left side of Eng's chest and right side of Chang's.

To avoid awkward repetition of phrases expressing the facts of the last sentence, the following characters

will be employed in describing the "lateral" surfaces of the band.

E. R., C. L. (Eng's right, Chang's left) will designate the "anterior" surface of the acquired position. C. R., E. L. (Chang's right, Eng's left) will designate the "posterior" surface. Since the right side of Chang's half of the band merged into the left on Eng's half, while the right side of Eng's half, after it passed the middle line, became the left half of Chang's, we propose using the characters E. L., E. R., and C. R., C. L., which will be understood as signifying left side Eng, right side Eng, etc.

Using the above signs we found that the surface E. R., C. L. was inclined decidedly downward and backward when seen in the congenital position, and was 3 in. high and $2\frac{1}{2}$ in. wide. At E. R., the border answering to the ensiform cartilage was marked by a large rounded tubercle; it was much more pronounced than on the corresponding border of C. L. When seen in the acquired position, E. R., C. L. became "anterior," when, at its upper margin, C. L. was longer than E. R. by one-half inch. The tubercle on E. R., already noticed, was much more prominent than C. L. The contour of the inferior margin was also different, being more uneven. C. L. was not only longer, but was more obliquely placed downward and outward to the centre of the band than E. R. (See cast in the Mütter Museum.)

III. Coverings of the Band.

In front (E. R., C. L.) the superficies could not be well examined owing to the restrictions imposed by the families. A view of it from within can be obtained in

Figs. 8, 9, *q. v.* Permission having been granted to make an incision "behind," at C. R., E. L., a modified letter-H incision was employed, thus—

Turning the skin flaps here indicated upwards and downwards, and the lateral triangles outwards, there was found beneath, a layer of superficial fatty connective tissue, with a well-defined layer of fat on either side, but with an intermediate portion which was free from fat, and of greater thickness.

The skin could with some little trouble be raised over the *dorsal or upper surface*, showing here entire absence of fat. A very delicate artery was found running across the middle, from Eng to Chang.

The lower portion of the surface C. R., E. L. was inseparably connected with the umbilicus. It was also united to the superficial fascia on C. L., about $1\frac{1}{2}$ inches from the umbilicus; this did not have any connection with the deeper parts. The process of fibrous tissue which had been felt through the skin was conspicuous on this surface of the band, and was covered by a delicate non-fatty layer of connective tissue. Towards the lower part of the surface were seen several diverging lines of fibrous tissue, which were lost within the integument about the umbilical scar, at the lower surface of the band. They were exceedingly thin, and at one point lay directly over the posterior and inferior wall of the umbilical pouch of Chang.

Turning down the superficial layer, the aponeurosis of the external oblique muscle was exposed (Fig. 3). A marked contrast was exhibited in the two sides of the band. In Chang the parts were normal so far as

they were exposed—the characteristic apertures for the escape of small vessels being abundant and conspicuous. In turning down the superficial fascia in Eng (Fig. 3, A), it was found to be continuous at its

FIG. 3.

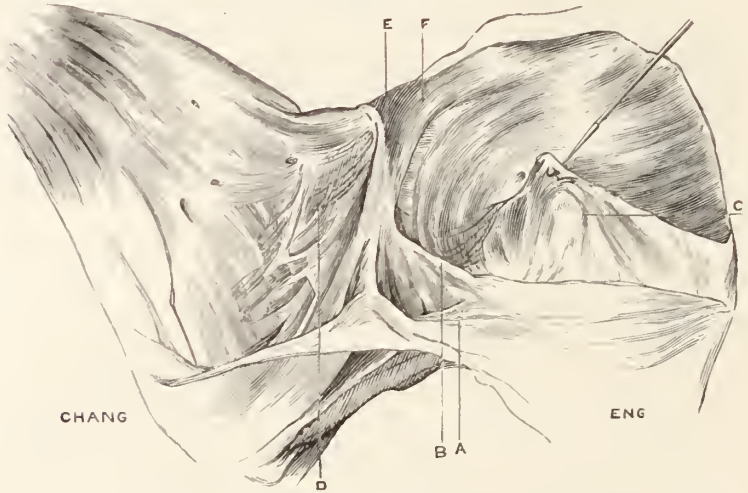


FIG. 3. The surface, C. R., E. L., exposed by removal of skin and superficial fascia to display the tendons of the external oblique muscles and adjacent parts.

A. The superficial fascia—lost over the position of Chang's umbilical pouch.

B, C. Supplemental layers of fibrous tissue of Eng not seen in Chang; B is a continuation toward Eng of aponeurotic fibres having a source from the linea alba of Chang; C is independent of the former, and is continuous with the deep pectoral fascia.

D. The interlacing of fibres on tendon of external oblique muscle of Chang.

E. The linea alba of Chang, beginning at C. R.

F. Its continuation to E. L., and insertion upon the ensiform cartilage.

lower portion with an aponeurotic layer (Fig. 3, B), which extended toward the median line, where it was continuous with the linea alba of Chang. In addition to this, a second layer (Fig. 3, C), analogous in position to a deep layer of the superficial fascia, which was

entirely independent of Chang, extended over nearly the whole of Eng's division, and was particularly well defined over the fibres of origin of the external oblique muscle. This was continuous with the deep layer of the superficial fascia which passed over the entire side of Eng's thorax.

Toward the middle of the band this layer gradually lost its distinctive features, and was firmly incorporated with the tendon of the external oblique muscle. A number of fibres corresponding to it extended in inseparable intimacy with this tendon. These were gradually lost as they approached the linea alba of Chang, and the parts being in position these fibres were at their lower portion covered in by the aponeurotic extension of the linea alba already mentioned.

On Chang's side, as we have seen, the parts comparable to these accessory layers were absent. There was no line of demarcation between the tendon of the oblique and the aponeurotic attachment of the pectoralis. The tendon of the external oblique presented a different appearance from the normal one in a more extensive interlacing of fibres of the linea alba with the tendon.

The part termed above the linea alba of Chang (Fig. 3, E), has already been indicated through skin and superficial fascia. As can be seen, this band of fibres, having its origin from the middle line of the abdomen of Chang, was found to be a direct continuation of the linea alba. It was remarkable in not being inserted into the ensiform process of Chang, but into that of Eng, and in giving off the aponeurotic outshoot B, already noticed, as well as in having a diffused point of insertion into Eng's tissue as in the ensiform carti-

lage (F). In a word, the linea alba approaches the surface C. R., E. L. from C. R. below, and is inserted into E. L. above.

IV. Organs of Abdomen as observed in position through the Incisions.

Limited incisions being alone permitted, the large vessels of the abdomen were sought for in the process of embalmment, believing, as we did, that the procedures of securing them would enable us, by extending the cuts from below upward, to fairly open the abdomen and examine thereby the interior of the band.

In each body, therefore, an incision six inches long (Fig. 2, *a b*, *c d*) was extended from the centre of the right iliac region to the centre of the right hypochondriac region. This was subsequently joined by an oblique incision passing from the upper end of the first mentioned to the lateral border of the ensiform cartilage at its base. This incision measured $7\frac{1}{2}$ in. The lower end of the vertical incision was met by a horizontal one passing to the centre of the hypogastric region, and measuring $3\frac{1}{4}$ in.

Through these incisions were studied (1) the *umbilical ligaments* and (2) *the abdominal viscera*.

1. *The umbilical ligaments.*[1]—By turning forward the anterior flap in Eng as far as possible, the peritoneal lining was exhibited, and there was brought into view a structure beginning at the summit of the bladder, and which, ascending the abdominal wall and passing obliquely to the right side, could be traced

[1] The folds of peritoneum containing remains of the hypogastric arteries will be called throughout by the name of *the umbilical ligaments*.

clearly to the scar-like tissue marking the remains of the umbilical structures situated upon the anterior abdominal wall within about $1\frac{1}{2}$ in. of the band. This structure was the umbilical ligament (Fig. 4, A). It was loaded with fat, and, as it terminated at the scar, distinct lobules of fat (several of which were pedunculated) were abundantly deposited.

The bladder was distended and raised 5 in. above the pubis.

FIG. 4.

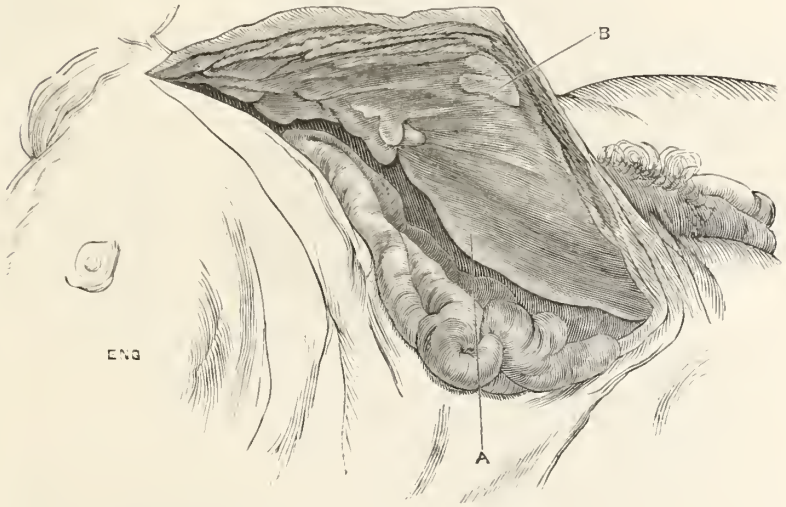


FIG. 4. The umbilical ligament in Eng.
A. The umbilical ligament.
B. The lobule of fat at position of the normal umbilicus.

In Chang (Fig. 5), the same appearances were seen as those above given, save that no fat was deposited in the umbilical ligament. On the contrary, it resembled the omentum of an emaciated subject. When stretched, the fold was fully an inch wide, quite transparent, and marked by two longitudinal bands, which

recalled the shapes of the obliterated vessels. But two rather small sessile fatty appendages were seen at the scar.

The bladder was empty, contracted, and lay within the true pelvis.

FIG. 5.

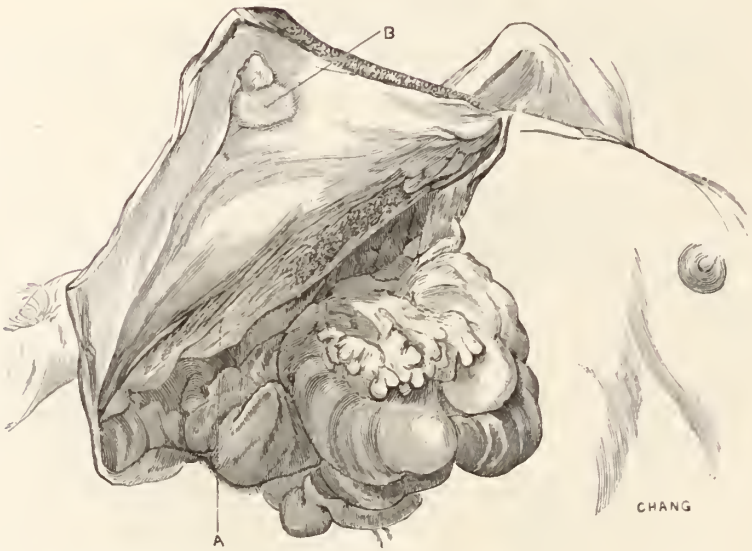


FIG. 5. The umbilical ligament in Chang.
A. The umbilical ligament.
B. The lobule of fat at position of the normal umbilicus.

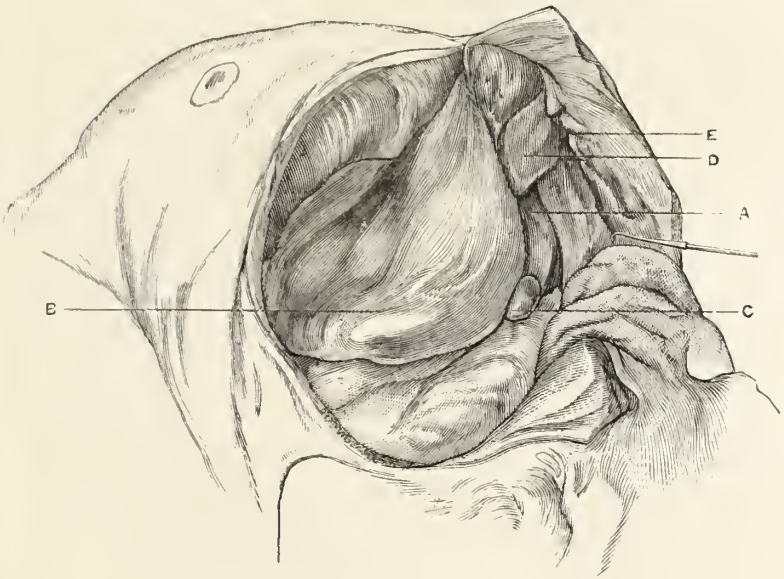
In both Chang and Eng an isolated mass of sub-peritoneal fat, presenting a sub-circular form, and measuring 1 in. in diameter, was found in the position of the normal umbilicus (Figs. 4 and 5).

2. *The viscera.*—In Eng the omentum was gathered up toward the transverse colon. It was abundantly furnished with fat.[1] The transverse colon extended

[1] The presence of a great amount of adipose tissue throughout, in Eng, was very noticeable as contrasted with the emaciated appearance of the tissues in Chang.

across the abdomen, beginning on the right side on a level with the eleventh rib. It was contracted and contained a little flatus. The rest of the exposed region was occupied by coils of small intestine, yielding a mesentery very rich in fat. The stomach was not visible. By removing the small intestine, and bringing down the transverse colon and large intestine, the pyloric extremity of the stomach was seen. The fundus of stomach, spleen, and left kidney were not seen. (Fig. 6.)

Fig. 6.



ENG

Fig. 6. The abdominal organs in Eng—the small intestines removed.

A. Left lobe of liver.

B. Right lobe of liver.

C. Gall-bladder.

D. Suspensory ligament.

E. Lobules of fat in the position of the termination of the umbilical ligament.

The liver.—The right lobe was alone visible. This extended entirely across the right hypochondriac and epigastric regions. Its external free border was not in contact with the ribs. Between it and the external abdominal wall there was an interval of nearly an inch at its greatest part, which was crossed by the external lateral ligament. The inferior border of the lobe rested upon and nearly concealed the pylorus of the stomach as well as the upper half of right kidney. Corresponding in position to the upper portion of the right kidney was a well-defined layer of peritoneum, presenting a sharply defined internal border. Upon dissecting away the peritoneum from this border it was found to answer to the inferior vena cava. The lesser omentum occupied its usual position. The fundus of the gall-bladder was two-thirds of an inch beyond the anterior border of the lobe, immediately to the outer side of the caudal lobe. The position of the longitudinal fissure was well off to the left side of the abdomen, presenting, between the right and left lobes, a conspicuous cleft which was partially occupied by the base of the caudal lobe. The round ligament, with its associated suspensory ligament, had doubtless passed nearly vertically, before the relations had been disturbed by the incision in the abdominal wall, upwards and forwards to the anterior abdominal wall at a point lying one inch to the outer side of the centre of the umbilicus.

In the subject, as it lay on the table with the flap *a*, *b* (Fig. 2), turned to the left, the suspensory ligament had the appearance of being much more obliquely inclined to the left, and could be made nearly horizontal by a little traction. Lying beneath this

ligament, but belonging to the anterior abdominal wall, was a large mass of subperitoneal fat about the size of a pigeon's egg. Extending to the extreme left, and continuous with the anterior border of the left lobe of the liver, was a delicate prolongation of liver substance which was lost within the connecting band.

FIG. 7.

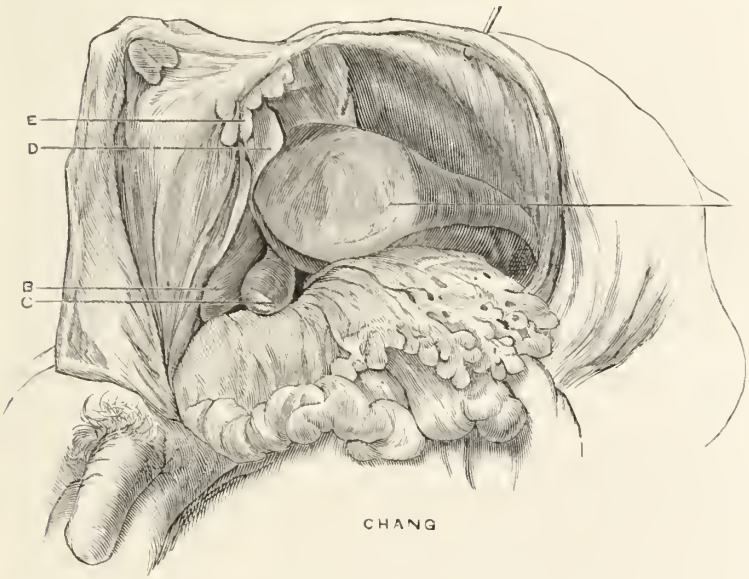


FIG. 7. The abdominal organs of Chang in position—the small intestines removed.

A. Left lobe of liver.
B. Right lobe of liver.
C. Gall-bladder.
D. Suspensory ligament.
E. Lobules of fat in the position of the termination of the umbilical ligament.

The upper surface of this prolongation was supported by a fold of peritoneum, extending directly upward, apparently attached to the base of the ensiform car-

tilage. Visible upon the anterior aspect of this fold was a tortuous artery, afterwards found to be the left internal mammary. This fold may be called *the accessory suspensory ligament;* nothing similar to it was seen in Chang. The left lobe of the liver, save a portion of its anterior edge, was not visible.

In Chang (Fig. 7), by exposing the parts as in Eng, throwing the abdominal flap, *c*, *d* (Fig. 2), to the right, there was at once brought into view the transverse colon, the greater omentum, and greater curvature of the stomach. The latter organ was large, empty, and without any undue traction could be so displayed as to yield its fundus and greater curvature in position. The fundus was not visible. Lying conspicuously within the left hypochondriac region was the spleen. Its inferior free border, with its peritoneal attachment, was distinctly seen; its upper portions, however, were invisible. The left lobe of the liver held a position answering to that of the right lobe in Eng—the external lateral ligament being stretched across the left hypochondriac region, pursuing a similar course to the external lateral ligament of Eng (*q. v.*). The left lobe at its outer portion rested upon the spleen, its inner portion upon the stomach. The outer portion of the left lobe presented a thin compressed border, the inner portion was divided by a deep sulcus into two lobes.

The right lobe lay deep within the right hypochondriac region, the portion about the longitudinal fissure anteriorly, alone appearing in the dissection. The suspensory ligament held a position similar to that in Eng. The gall-bladder held its normal position to the right lobe, and was moderately distended with bile.

Both Chang and Eng had the organs occupying the hypochondriac and epigastric regions retaining, on the whole, such relations as are usually observed.

This statement appears pertinent, at this stage of the autopsy, in order to explain—

V. Interior of Band.

We here describe (1) *the hepatic pouches;* (2) *the umbilical pouches;* (3) *the vascular structures of the band;* (4) *the diaphragms;* (5) *the ensiform cartilages.*

1. *The hepatic pouches.*—The photograph (Fig. 2) indicates the position of the right lobe of Eng's liver in the right hypochondriac region. The right lobe of Chang is of course not seen in the figure, since it lies on the side of the body which is not in the field of vision. It must follow from the rights and lefts of the two individuals being opposites that, in drawing a line between the livers (which, as already seen, occupy normal positions as to right and left) across the band, such a line will be diagonal to the axes of the ensiform cartilages; Chang's half of the band having the line enter the band from his "right," Eng from his "left." It will also follow that any pouches of peritoneum which might accompany this line will pursue a similar direction—be on the same plane—be right or left with respect to the axis of that plane. Now it was actually demonstrated that such a line did extend between the livers, and was accompanied by such peritoneal pouches. These pouches were termed the hepatic pouches, and may be described as follows:—

Chang.—The subject lying on the table with rights and lefts determined as in the acquired position, the finger could be inserted behind the suspensory liga-

ment (Fig. 7) in a pouch lying directly beneath the ensiform cartilages, into which passed an extension of liver-like tissue.

Eng.—This fact could not be well demonstrated in Eng in this position, but is well seen in Fig. 8.

It follows that the two hepatic pouches are on nearly the same plane, and that each approaches the central point of the band diagonally from the right side of the subject with whose abdominal cavity it is continuous.

2. *The umbilical pouches.* — Beneath the hepatic pouches, and between them and the inferior border of the band, were two pouches which, from their association with the round ligament, have been termed *the umbilical pouches.*

When the finger was passed toward the band from the abdomen of Chang, and following the peritoneum of the anterior wall of the abdomen, it passed into a pouch of the band directly over the skin covering, across the band, over the umbilicus, and was received within the folds of the suspensory ligament of the liver of Eng. This pouch was so superficial that while the finger was in the pouch any motion of the finger was readily followed by the observer.

In the same way as above, if the finger was introduced *behind* the suspensory ligament of Eng, it slipped into a pouch which passed across the median line of the band, and was received within the folds of the suspensory ligament of the liver of Chang.

There were then two pouches communicating with the two abdominal cavities, arranged one above another in the band, Chang's being the lower of the two. No remains of an umbilical vein were detected, nor was

there any communication between the pouches and the umbilicus. It has already been noticed that the round ligament of each liver passed from the longitudinal fissure to a scar on the anterior wall of the abdomen near the band. It was not, therefore, within the round ligaments, but the folds of the suspensory ligaments, that the pouches were found.

Eng's pouch measured $2\frac{1}{2}$ in. From edge of Chang's suspensory ligament to end of hepatic pouch measured 3 in.

Extending across the band, about midway between the properties of the two individuals, was a septum. It was attached above and below to the respective boundaries of the band, and along its entire length was incorporated with its two peritoneal cavities, so that when in the course of the dissection of the "posterior" surface of the band the peritoneal covering of the band was displayed, several large lobules of fat were seen lying to Eng's side of the septum.[1]

It will be seen that Fig. 8 represents the band opened to display the pouches with the septum. The lower end of the septum is fixed near the scar of the umbilicus, and holds an immobile position over the umbilical pouches. At this point it is free from fat. But as it extends over the hepatic pouches it is more pliant. This portion of the septum has been carried a little to Chang's side of the band to display the entire length of the hepatic pouch of Eng.

[1] Before the septum was known to exist, the band was opened from behind in the presence of the Fellows of the College (Feb. 18th, 1874). The exact relations of the septum could not at that time be determined. Figs. 8, 9, and 10 are taken from studies of the parts made the day after the meeting.

Figs. 9 and 10 are designed to exhibit the appearances presented in securing views of the septum from

FIG. 8.

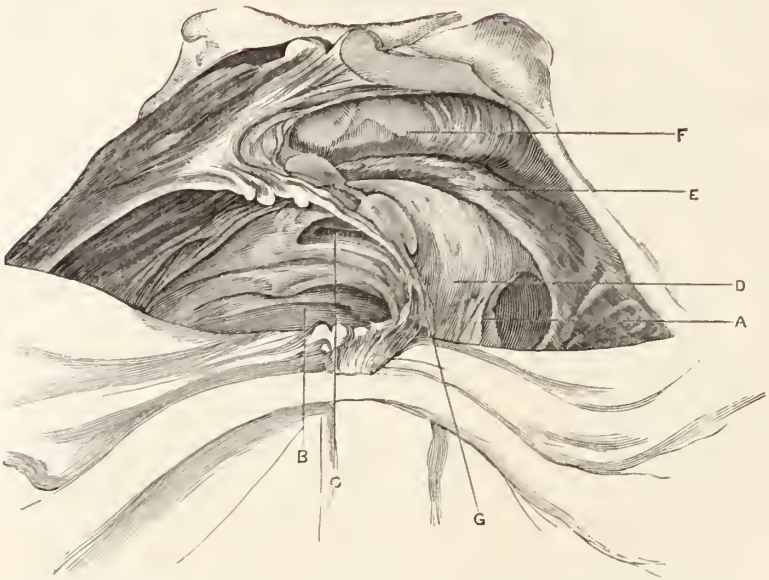


FIG. 8. The surface, C. R., E. L., showing the interior of band by free division of the aponeuroses seen in Fig. 7, and their underlying peritoneal attachments.

A. The orifice of umbilical pouch of Eng.
B. The orifice of umbilical pouch of Chang, showing connection with suspensory ligament of Eng.
C. The fenestrated umbilical pouch of Eng passing between the folds of the suspensory ligament of Chang.
D. Suspensory ligament of liver of Eng.
E. Hepatic tract.
F. Hepatic pouch of Eng.
G. The septum.

its sides. Fig. 9 is the side toward Chang, and Fig. 10 is the side toward Eng.

The pouches and septum were now removed and the position of the hepatic tract determined. It rested

upon the incurved borders of the ensiform cartilages (see Fig. 15), and as the subject lay on the table with the "posterior" surfaces of the band exposed (Fig. 11) the hepatic tract was slightly arched. It measured three inches in length, was compressed, and measured six lines wide and three lines thick. The tract arose from the livers at the same point—namely, directly

FIG. 9.

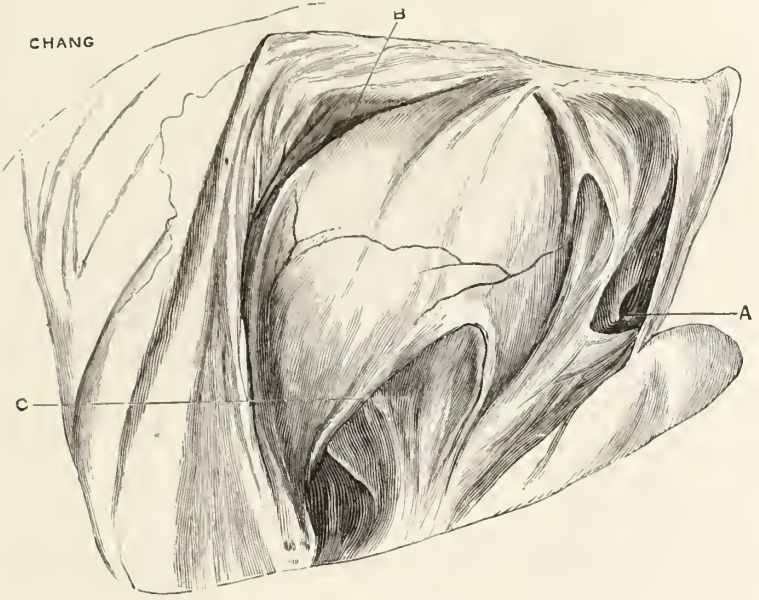


FIG. 9. The septum viewed from Chang's side.
A. The orifice of umbilical pouch of Chang.
B. The orifice of the hepatic pouch of Chang.
C. Suspensory ligament of Chang containing umbilical pouch of Eng.

above the longitudinal fissure, having more fulness on the side of the right than of the left lobe. The round ligament, as it passed out of the longitudinal fissure of each liver, was placed beneath and a little to the left of the tract.

FIG. 10.

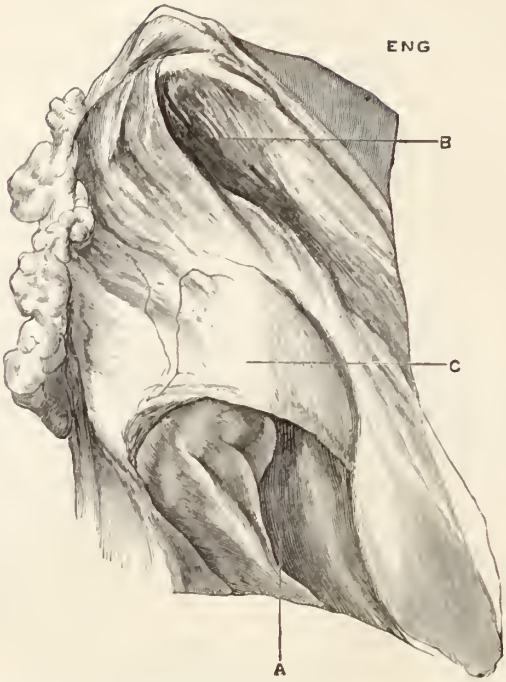


FIG. 10. The septum viewed from Eng's side.
A. The orifice of the umbilical pouch of Eng.
B. The orifice of the hepatic pouch of same.
C. Suspensory ligament of Eng containing the umbilical pouch of Chang.

3. *The vascular structures of the band* were as follows:—

The livers being united, it was found that a colored injection thrown into the portal vein of Chang passed into the liver of Eng. A careful dissection of the bloodvessel (Fig. 11, c) proved it to be a terminal twig of the portal system of Chang. It was of the thickness of a No. seven catheter, French scale, gradually diminished in size, and was lost toward the centre of the band. It did not pass as such across the band,

but appeared to break up into minute branches before reaching the liver of Eng. At the same time there was undoubted distension of the portal capillaries with the colored fluid under the capsule of the dorsal surface of the right lobe of Eng's liver, one and one-half inches from the band. Examination of the branches of the mesenteric veins of Eng revealed the curious fact that some of them had received the in-

FIG. 11.

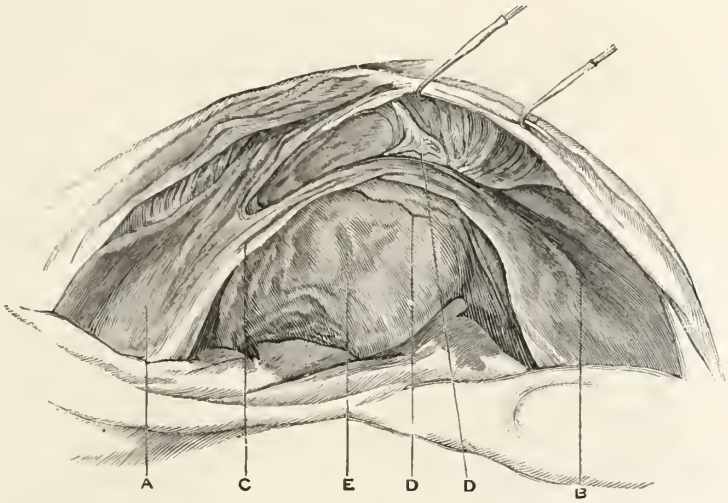


FIG. 11. The surface, C. R., E. L., with pouches removed to display the hepatic tract.

A. Liver of Chang.
B. Liver of Eng.
C. Portal vessel of Chang.
D, D. Minute branches of hepatic artery.
E. Subcutaneous fat of surface, E. R., C. L.

jection. This had not been transmitted through the liver, for the portal vein at the transverse fissure was empty, but through a distinct extra-hepatic portal track, which was found lying under the peritoneum

beneath the position of the hepatic pouches, and in association with the umbilical pouches. This vessel began by relatively large radicals towards Chang's side, became larger as these encroached on Eng's side, and was finally received within the portal system of Eng's body, as a tributary to its mesenteric vein.

No other vessels were met with in the band excepting a few insignificant branches of the hepatic artery, and the terminal twigs of the right internal mammary of Eng. The former vessels are marked D, D, Fig. 11. The latter vessel terminated by piercing the diaphragm, and giving ultimate filaments to the integument of the "front" of the band as shown in Fig. 12.

FIG. 12.

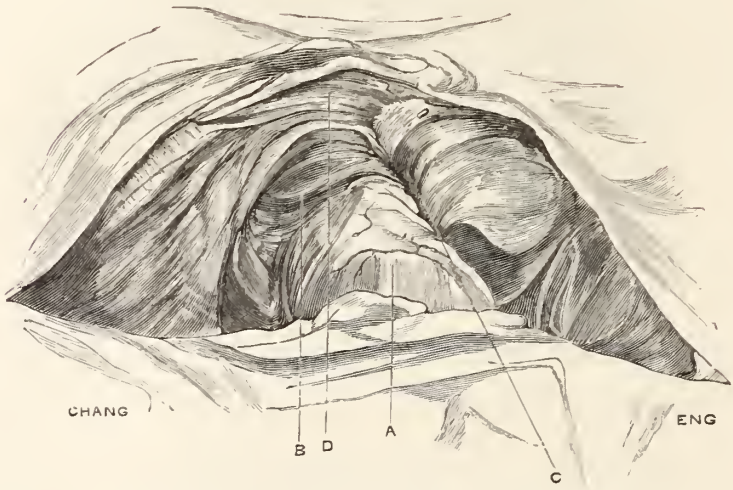


FIG. 12. The surface, C. R., E. L., with pouches, hepatic tract, and peritoneal attachments removed to display the diaphragms.

A. Subcutaneous fat of surface, E. R., C. L.

B, C. Symmetrical muscular fasciculi.

D. Fasciculi of Eng crossing the median line of the band.

4. *The diaphragms.*—The subject being in the same position as in Fig. 2, the livers were removed, the peri-

toneal coverings dissected from the band, and the diaphragms exposed (Fig. 12). The point (A), marked by the terminal twigs of the right internal mammary of Eng, indicated the "anterior" of the band. A broad slip of fibres of Chang (B) was seen to pass across the median line, and to be inserted into the left border of the ensiform cartilage of Eng (Fig. 17). This arrangement would appear to correspond to the smaller collection of fibres (C) belonging entirely to Eng. A second

FIG. 13.

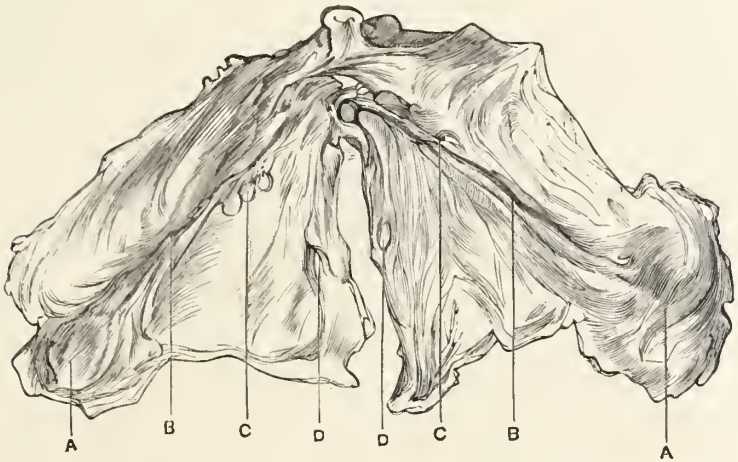


FIG. 13. The peritoneal linings of the anterior walls of both abdominal cavities.

A, A. The summits of the bladders.

B, B. The umbilical ligaments.

C, C. The nodules of fat at the parietal scar.

D, D. The isolated lobules of fat.

arrangement of fibres was seen above those just indicated, immediately under the cartilages (D). This appeared to arise from the border of the cordiform tendon of Eng by two distinct narrow slips, which crossed the median line to be inserted dispersedly on the diaphragm of Chang.

5. *The ensiform cartilages.*—After removing the diaphragms the cartilages were exposed. They may be described as follows:—

Chang.—The cartilage measured $2\frac{1}{2}$ in. wide, and 8 in. in length along its axis. The right border was very prominent, and projected $\frac{1}{2}$ in. beyond the limit of the corresponding border in Eng. It was almost in close contact with the cartilage of the eighth rib; it was very robust, with upper surface convex, under surface nearly plane. The left lateral border was $2\frac{1}{2}$ in. in length, right lateral border 11 lines in length. The former was marked by three tubercles of about equal size. One situated about 1 in. from the sternal origin; the other about 2 in. from the same point; the third at its extreme anterior border. None of these were robust, or presented any of the thickening noticed on the right side. The middle of these tubercles was on a line with that of the posterior tubercle. The junction of the ensiform process with the sternum was not marked by the eminence characterizing the similar point in Eng.

Eng.—The cartilage differed from that of Chang in being $2\frac{1}{3}$ in. wide, 11 lines in length of axis. The left lateral border was abruptly deflected downward, and did not present the transverse smooth projection noticed in Chang. This deflection was almost at right angles to the dorsal surface, acuminate inferiorly, and presenting a straight surface toward Chang, and an oblique one toward the ribs. The length of left lateral border was 1 in. The right lateral border, $1\frac{1}{3}$ in. in length, presented a smooth sub-rounded edge without tubercles, and terminated in a free rounded border on a plane a little above that of Chang. On the whole

this border was more robust than that of Chang. On the dorsal aspect of the process near its base was seen the rounded eminence described in the account of the external appearances (see page 7).

A comparison between the two ensiform cartilages shows that in Chang the anterior border was longer than in the right in Eng. In other proportions Eng's was equal if not larger than Chang's, and was more robust.

The union between the cartilages was of the character of a symphysis. The union was very intimate along the border E. L., C. R., "posterior" (Fig. 14); the

FIG. 14.

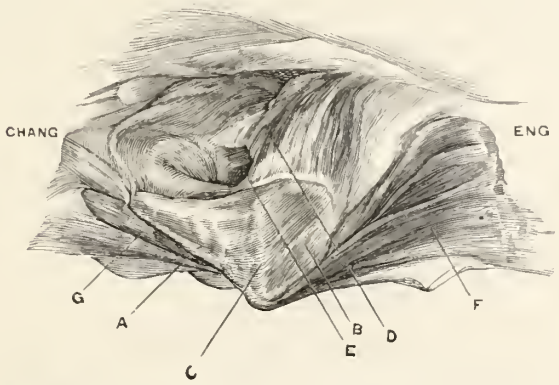


FIG. 14. A section of both ensiform cartilages, C. R., E. L.

A. Chang's cartilage.
B. Eng's cartilage.
C. The synchondrosis.
D. The bursa-like sac covering the same.
E. An opening into the sac.
F. Transversalis muscle of Eng.
G. Transversalis muscle of Chang.

exposure of the junction by a delicate transverse cut showed a close union between the cartilages, thus constituting this part of the band a synchondrosis. That

this, however, did not characterize the entire line of apposition was at once seen by turning to the border E. R., C. L. ("anterior"), where an interval, two lines in width, was seen between the cartilages, an interval which had been evidently susceptible of variation during life. This interval extended across one-fourth the width of the band. The portion of the band between the parts as above indicated, was occupied by a bursa-like sac (Fig. 14, D), which was opened by a minute orifice (E) to display its true nature. This sac was crossed above by a stout band of fibrous tissue (Fig. 15, A) an inch in width. Beneath, the sac was protected by a less well-defined band of the same width as the upper ligament, and which crossed between the two processes, to be lost in the perichondrium.

FIG. 15.

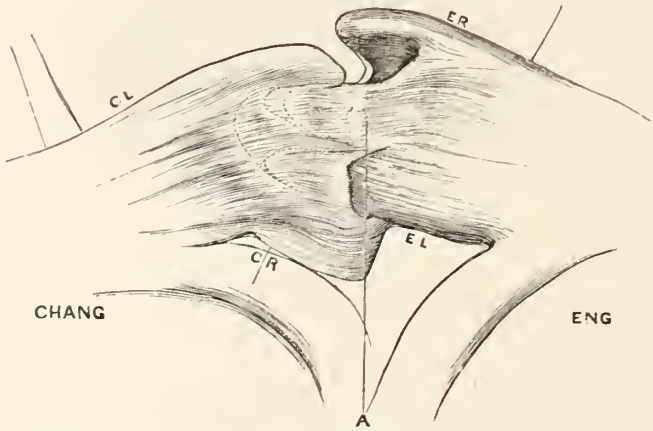


FIG. 15. Upper surface of ensiform cartilages.
A. The upper ligament uniting the cartilages.

Viewing the cartilages as the constituent parts of the band, we found the border C. L., E. R., the "anterior," to be longer than C. R., E. L., the "posterior."

C. L., E. R. was a convex, nearly even border, C. L. being larger than E. R., with a gaping interval placed nearer Eng than Chang. C. R., E. L. was an irregular, uneven border, without interval, C. R. being smaller than E. L., and placed to the outer side.

VI. Other Structures.

1. *The spleens.*—This organ in Eng was 5 in. long, $3\frac{1}{3}$ in. wide. The dorsum was marked by a large sulcus, extending nearly across the organ, continuous with the sulcus on the superior border. The hilus was relatively shorter than that of Chang, beginning above, fully an inch below its upper border, and terminating within a half inch of its inferior border.

In Chang it measured 5 in. long, $2\frac{1}{3}$ in. wide. It was sub-elliptical in form, upper lip somewhat abruptly compressed. The lower border was obtuse and rounded. The dorsum was smooth, and presented at its posterior edge a single sulcus placed midway between the tip and the inferior border. The hilus extended nearly the entire length of the under surface.

2. *The livers* (Fig. 16).—In Eng the liver was 9 in. broad. The right lobe was $7\frac{1}{2}$ in. wide, antero-posteriorly. The fundus of the gall-bladder was seen on the anterior edge of the organ. The only noticeable feature on the under surface of the liver, was the lobus Spigelii. This was large, measuring 2 in. in transverse diameter, and $2\frac{1}{3}$ in. in antero-posterior diameter. It presented a somewhat increased breadth of neck, which was overlapped by an anterior prolongation of the lobe, and terminated by a rounded compressed extremity at the transverse fissure. The quadrilateral lobe was

well developed, 2 in. long in greatest diameter, 10 lines wide.

Fig. 16.

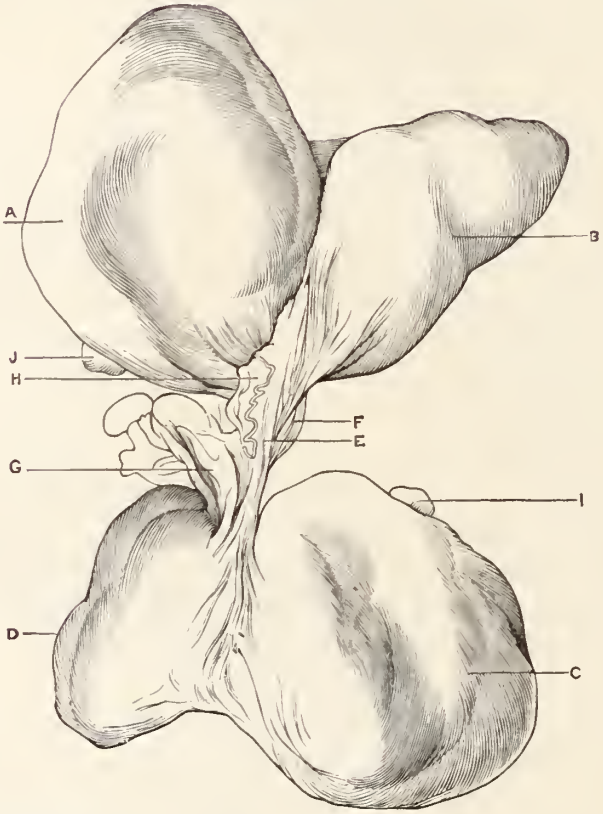


Fig. 16. The livers.

- A. Right lobe of Eng.
- B. Left lobe of same.
- C. Right lobe of Chang.
- D. Left lobe of same.
- E. Hepatic tract.
- F. Round ligament of Eng.
- G. Round ligament of Chang.
- H. Accessory suspensory ligament of Eng, with termination of the right mammary artery.
- I. Fundus of gall-bladder of Chang.
- J. Fundus of gall-bladder of Eng.

In Chang the liver was $8\frac{1}{3}$ in. broad. The right lobe was 5 in. wide, antero-posteriorly. The appearance of the gall-bladder corresponded to that seen in Eng. The under surface was normal. The lobus Spigelii presented a narrower neck than in Eng, the

FIG. 17.

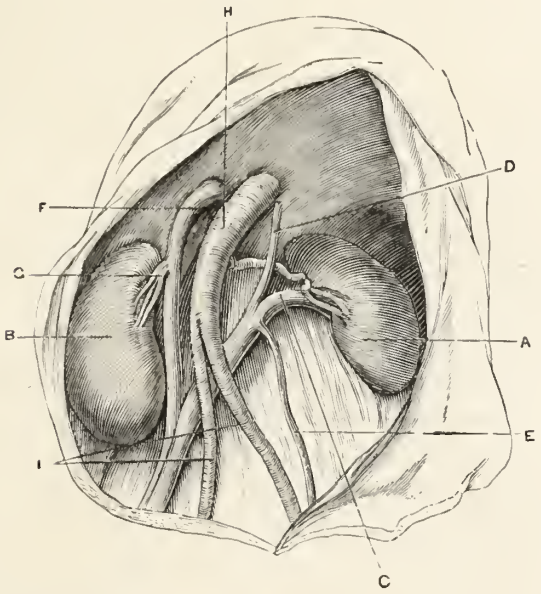


FIG. 17. Kidneys of Eng.
- A. Left kidney.
- B. Right kidney.
- C. Left renal vein.
- D. Left supra-renal vein.
- E. Left spermatic vein.
- F. Descending vena cava not distended with clot.
- G. Right renal vein.
- H. Aorta distended with plaster.
- I. Primitive iliac arteries.

anterior prolongation being greater. The quadrilateral lobe was less developed than in Eng. Indeed it was not raised above the under surface of the right lobe,

and its limits were so imperfectly marked that it could not well be measured.

3. *The kidneys.*—In Eng, the body lying on the table E. R., C. L., the left kidney (Fig. 17, A) was 4 in. long, $1\frac{1}{2}$ wide at its hilus, and of the usual kidney shape. It lacked $\frac{1}{2}$ in. of reaching the crest of the ilium. The renal vein (Fig. 17, C) of the same side measured 3 in. in length, and was decidedly oblique in position, its termination in the cava being below the level of the lower end of the kidney.

The right kidney (Fig. 17, B) corresponded in position to the left kidney of Chang, that is to say, it was in the shallower portion of the abdomen, and in contact with the abdominal wall. It measured 4 in. in length, and $2\frac{1}{4}$ in. in width. Its inferior border lacked 2 in. of reaching the superior crest of the ilium. The renal vein ascended a little upward to enter the cava a little below the level of the upper end of the kidney.

In Chang, the body lying in such a way that the great trochanter of the right side rested on the table, the left trochanter being raised three inches from the same plane, an obliquity was given to the trunk, and rendered the position of the abdominal organs somewhat anomalous.

The left kidney (Fig. 18, A) lay with its lower half clearly within the iliac fossa, its inferior border answering to a point an inch and a half below the termination of the aorta. The organ lay, at its inner and inferior portion, upon the left primitive iliac vein; it measured $3\frac{3}{4}$ in. in length, and $2\frac{7}{12}$ in. in width at its widest part. It was larger below, where it retained the usual appearance, but was somewhat abruptedly pointed

above, and was marked by the characteristic notch on its inner side. The renal vein (Fig. 18, c) was very obliquely situated, indeed was almost parallel with the cava, and was $3\frac{1}{2}$ in. long. The termination of the renal vein answered to a line running across the abdomen lying fully 1 in. above the upper end of the left kidney.

Fig. 18.

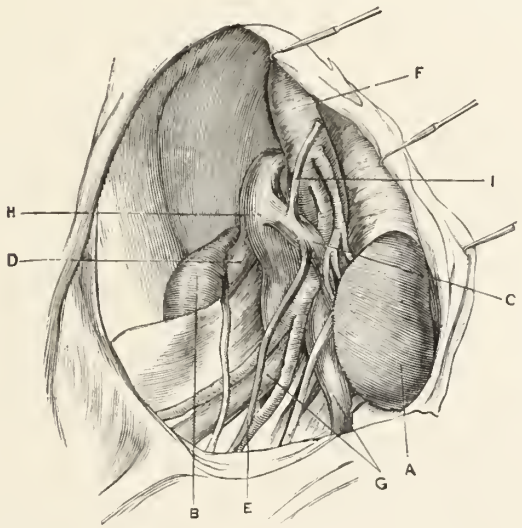


Fig. 18. Kidneys of Chang.

- A. Left kidney.
- B. Right kidney.
- C. Left renal vein.
- D. Right renal vein.
- E. Left spermatic vein.
- F. Aorta filled with plaster.
- G. Primitive iliac veins.
- H. Descending cava distended with clot.
- I. Left supra-renal vein.

The right kidney (Fig. 18, B) was normally situated. It measured 4 in. in length, and $1\frac{1}{2}$ in. in width at its centre, and presented the usual reniform appearance.

Its inferior edge just reached an eminence answering to the superior crest of the ilium.

4. *The testicles.*—The right testicle of Eng was normal. The left testicle was not within the scrotum. Dissection from within the abdomen showed that the organ had been retracted. It lay well concealed within the inguinal canal, slight traction making it appear within the abdomen.

The testicles of Chang were normal.

5. *The hearts.*—The heart in Eng was situated nearer the median line than normal. The abdominal incision was very unfavorable for studying its exact position in the mediastinum. It was removed through an opening made in the diaphragm. The right side of the heart was occupied by a soft grumous clot much smaller than was found in the same locality in Chang, and which did not distend the cavities. The left side was normal. It was without clot so far as could be determined in the injected condition of the ventricle.

The heart of Chang presented a right auricle and ventricle distended with a dense venous clot; this extended from the right ventricle along the pulmonary arteries. The left side of the heart was empty.

The ductus arteriosus and foramen ovale were firmly closed in both hearts.

6. *The vessels.*—The arteries of both subjects were, so far as examined, in an extremely atheromatous condition. Large plates of calcareous matter were deposited in the abdominal aortas. The injecting matter flowed insufficiently in the left lower extremity of Chang, from a clot plugging the femoral artery.

The venous system of Chang was engorged, giving the appearance of these vessels having been injected after death; that of Eng was comparatively empty.

7. *The lungs.*—The lungs were so altered by *post-mortem* changes prior to embalming, their contraction by the chloride of zinc, and their increase of weight from the plaster, that no extended examination was made of them. But little difference was seen between the conditions of the lungs in the two men. No hepatization was present in Chang.

8. *The vertebral column and ribs.*—There was marked lateral curvature of the vertebral column in both bodies. This was more conspicuous in Chang. The convexity of the curve was about half-way down the vertebral column, and inclined in Chang to the right side. The distance from the centre of the vertebral column to the left abdominal wall, 2 in.; to the right abdominal wall, 5 in. The left side of the abdominal cavity, measuring from about the level of the band to the last rib of the right side, $7\frac{1}{2}$ inches.

The ribs in both Chang and Eng were 22 in number, 7 true and 4 false. On the right side of Eng the first, second, and third ribs were normal. The fourth, fifth, sixth, and seventh presented diminished intercostal spaces, owing probably to the extreme traction made on them by the deflection of the ensiform cartilages. The intercostal space between the third and fourth ribs was slightly contracted; that between the fourth and fifth ribs was very much contracted, the muscle being bulged inward. Between the fifth and sixth, and

sixth and seventh ribs the space was less contracted. The remaining intercostal spaces were about normal. The fifth rib near its articulation with the vertebral column formed a well-defined ridge within the thorax, carrying with it the sixth and seventh ribs, thus forming a rounded elevation, distinguishing the positions of these ribs from the thoracic wall above and below this point, where the parietal surface presented the usual concave appearance.

On the left side of Chang a similar arrangement of ribs and intercostal spaces was seen to the above.

The remaining organs were not examined.

REMARKS.

With reference to the cause of death of the Siamese twins it may be briefly said that, in consequence of the restrictions by which we were bound, no examination of the brains was made. It cannot, therefore, be proved that the cause of Chang's death was a cerebral clot, although such an opinion, from the suddenness of death, preceded as it was by hemiplegia and an immediate engorgement of the left lung, is tenable. Eng died, in all probability, in a state of syncope induced by fright—a view which the over-distended bladder and the retraction of the right testicle would appear to corroborate.

The existence of lateral curvature was not unsuspected. It was known to those who had examined the twins before death. Indeed, it must have been a necessity of the acquired position.

The presence of a pad of subperitoneal fat at the usual position of the umbilicus was certainly curious.

It would appear to be an example of a localized nutritive change about the peritoneum, at the centre of the umbilical region, anticipating the exit of the vessels of the cord at that point. Familiar examples of this anticipation between structures developing from different layers of the embryo are seen in malformations of the genital organs, eye, ear, etc. In the above example it is remarkable only from the rarity of the conditions yielding it.

The circulation in each individual of the twins was practically complete, since the demonstration of continuity between the portal systems, although satisfactory, invites the conclusion that the amount of blood which passed from one to the other side of the band must have been, in the condition of the parts at the time of the demonstration, very inconsiderable, and was not competent in all probability to modify the performance of any act of the economy.

In the fœtal and early period of extra-uterine life the vessels must have been more capacious, and associated with a large tract of liver tissue. It follows, all things being equal, that an attempt at division of the band in early life would have been accompanied with more venous hemorrhage than at any subsequent period.

In proof that the twins were the product of a single conception, the strict correspondence between the markings of the two spleens, as well as the number of the ribs, may be observed. The absence of available data bearing upon the question of symmetry between visceral organs of twins, prevents us from drawing here too positive an inference. It is probable, however, that the twins were individuals of a single organism.

remarkable for its complete expression of duplex bilaterality.[1]

Fig. 19.

Fig. 19. Foreshortened view of the trunks, showing in the acquired position the band from above and the contours of its lateral surfaces.

[1] I desire to return thanks to Dr. T. H. Andrews and Dr. J. W. White, Jr., for important assistance rendered in preparing the notes of the autopsy.

DESCRIPTION OF FIGURES.

FROM PHOTOGRAPHS.

FIG. 1. Twins in acquired position (E. R., C. L.). Taken in St. Petersburg, 1870. Page 3.

FIG. 2. Twins in acquired position (E. R., C. L.). Taken after death at Philadelphia. Page 8.

FROM SKETCHES.

FIG. 3. The surface, C. R., E. L., exposed by removal of skin and superficial fascia to display the tendons of the external oblique muscles and adjacent parts. Page 12.

A. The superficial fascia—lost over the position of Chang's umbilical pouch.

B, C. Supplemental layers of fibrous tissue of Eng not seen in Chang; B is a continuation toward Eng of aponeurotic fibres having a source from the linea alba of Chang; C is independent of the former, and is continuous with the deep pectoral fascia.

D. The interlacing of fibres on tendon of external oblique muscle of Chang.

E. The linea alba of Chang, beginning at C. R.

F. Its continuation to E. L., and insertion upon the ensiform cartilage.

FIG. 4. The umbilical ligament in Eng. Page 15.

A. The umbilical ligament.

B. The lobule of fat at position of normal umbilicus.

FIG. 5. The umbilical ligament in Chang. Page 16.
The letters as in Fig. 4.

FIG. 6. The abdominal organs of Eng—the small intestines removed. Page 17.

A. Left lobe of liver.

B. Right lobe of liver.

C. Gall-bladder.

D. Suspensory ligament.
E. Lobules of fat in the position of the termination of the umbilical ligament.

FIG. 7. The abdominal organs in Chang—the small intestines removed. Page 19.
The letters as in Fig. 6.

FIG. 8. The surface, C. R., E. L., showing the interior of band by free division of the aponeuroses seen in Fig. 7, and their underlying peritoneal attachments. Page 24.
A. The orifice of umbilical pouch of Eng.
B. The orifice of umbilical pouch of Chang, showing connection with suspensory ligament of Eng.
C. The fenestrated umbilical pouch of Eng passing between the folds of the suspensory ligament of Chang.
D. Suspensory ligament of liver of Eng.
E. Hepatic tract.
F. Hepatic pouch of Eng
G. The septum.

FIG. 9. The septum viewed from Chang's side. Page 25.
A. The orifice of umbilical pouch of Chang.
B. The orifice of hepatic pouch of Chang.
C. Suspensory ligament of Chang, containing umbilical pouch of Eng.

FIG. 10. The septum viewed from Eng's side. Page 26.
A. The orifice of umbilical pouch of Eng.
B. The orifice of hepatic pouch of Eng.
C. Suspensory ligament of Eng, containing umbilical pouch of Chang.

FIG. 11. The surface, C. R., E. L., with pouches removed to display the hepatic tract. Page 27.
A. Liver of Chang.
B. Liver of Eng.
C. Portal vessel of Chang.
D, D. Minute branches of hepatic artery.
E. Subcutaneous fat of surface, E. R., C. L

FIG. 12. The surfaee, C. R., E. L., with pouches, hepatic tract, and peritoneal attachments removed to display the diaphragms. Page 28.

A. Subeutaneous fat of surface, E. R., C. L.

B, C. Symmetrical muscular fasciculi.

D. Faseieuli of Eng, crossing median line of band.

FIG. 13. The peritoneal linings of the anterior walls of both abdominal eavities. Page 29.

A, A. The summits of the bladders.

B, B. The umbilical ligaments.

C, C. The nodules of fat at the parietal scar.

D, D. The isolated lobules of fat.

FIG. 14. A section of both ensiform eartilages, C. R., E. L. Page 31.

A. Chang's cartilage.

B. Eng's cartilage.

C. The synchondrosis.

D. The bursa-like sac covering the same.

E. An opening into the sac.

F. Transversalis muscle of Eng.

G. Transversalis muscle of Chang.

FIG. 15. Upper surface of ensiform cartilages. Page 32.

A. The upper ligament uniting the eartilages.

FIG. 16. The livers. Page 34.

A. Right lobe of Eng.

B. Left lobe of same.

C. Right lobe of Chang.

D. Left lobe of same.

E. Hepatie tract.

F. Round ligament of Eng.

G. Round ligament of Chang.

H. Accessory suspensory ligament of Eng, with termination of the right mammary artery.

I. Fundus of gall-bladder of Chang.

J. Fundus of gall-bladder of Eng.

FIG. 17. Kidneys of Eng. Page 35.

A. Left kidney.

B. Right kidney.
C. Left renal vein.
D. Left supra-renal vein.
E. Left spermatic vein.
F. Descending vena cava not distended with clot.
G. Right renal vein.
H. Aorta distended with plaster.
I. Primitive iliac arteries.

FIG. 18. Kidneys of Chang. Page 37.
A. Left kidney.
B. Right kidney.
C. Left renal vein.
D. Right renal vein.
E. Left spermatic vein.
F. Aorta filled with plaster.
G. Primitive iliac veins.
H. Descending cava distended with clot.
I. Left supra-renal vein.

FIG. 19. Foreshortened view of the trunks, showing in the acquired position the band from above, and the contours of its lateral surfaces. Page 42.

CASE

OF

ADENOID (HODGKIN'S) DISEASE.

ENLARGEMENT OF THE CERVICAL GLANDS WITH MULTIPLE LYMPHADENOMATOUS TUMORS OF THE BRAIN, SPINAL COLUMN, LUNGS, STERNUM, SUBCUTANEOUS TISSUE, ETC. WITH REMARKS, AN ANALYSIS OF FIFTY-EIGHT RECORDED CASES, AND A BIBLIOGRAPHY.

By

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[Read May 6, 1874.]

The morbid specimens on the table were removed yesterday from the body of a young man who was under my care at the Pennsylvania Hospital, during the last three months of his life, and whose case is so interesting that I shall report it in full. It is scarcely necessary to say that the tumors which exist in such number in the different organs belong to the class of lymphadenomata, and that the condition which gives rise to them is usually called Hodgkin's disease, because Hodgkin[1] was among the first to direct attention prominently to it. It has recently been admirably described under the name "Adénie" by Trousseau, under that of "Diathèse lymphogène" by Jaccoud,

[1] Medico-Chirurgical Transactions, vol. xvii.

and still more recently by Dr. R. Southey, who has given to it the name of "Adenoid disease." Still another name is "Anæmia lymphatica," which has been applied to it by Dr. Samuel Wilks.

W. M. L., æt. 19, a native of Vermont, unmarried, and a news-agent by occupation, was admitted into the medical wards of the Pennsylvania Hospital, January 26, 1874. He did not come under my care until February 1, when the following notes of his case were made by my clinical clerk, Dr. George S. Gerhard.

"The patient's mother died of phthisis after having suffered for many years from enlargement of the cervical glands, but with this exception there seems to be no tendency to hereditary disease in his family. He has always been temperate in his habits, and has never had any form of venereal disease, or any serious illness before the present one began, about six weeks before his admission. At that time he complained of a feeling of soreness in the front of the chest, and in the muscles of the shoulders and arms. He did not, however, have actual pain until several days subsequently, when he became aware of a sensation of constriction at the base of the thorax. He also observed that his lower extremities were weak and numb. This symptom increased in severity until he was unable to walk except with assistance. The day prior to his admission he became absolutely paraplegic, and lost control over his bladder and rectum. He has never had any dorsal pain or any pain in the extremities, but has occasionally suffered from twitchings of the muscles. Upon inquiry it is discovered that he had at one time (some years ago) enlargement of the glands on the left side of his neck, but the enlargement of those on the right side, which is now apparent, was not observed until May last. Soon after his illness began he noticed a swelling over the upper bone of the sternum, which has gradually increased in size until it is now as large as half an orange. It has been from the first tender to the touch.

"Upon examination the patient is found to have complete paralysis of motion and sensation of all the parts of his body below the thorax. The parts in which sensation is preserved can be sharply separated from those in which it is lost, by dragging a pin along the surface of the abdomen, where it is not felt at all. As soon, however, as the lower part of the thorax is reached, it is distinctly perceived. He complains also of a feeling of constriction at about the level of the line separating the sensitive from the paralyzed parts, but he has no pain or tenderness along the dorsal vertebræ. There are, moreover, no contractions and no spasmodic twitchings of the muscles, but there is a notable increase of reflex movements. The palsied muscles respond fairly well to an induced current of moderate intensity, but feebly so to the galvanic. On the right side of the neck there is a mass of much enlarged glands, firm to the touch and not tender. Upon closer examination it is possible to trace the outlines of several glands which appear to be loosely bound together. At the inner part of the upper eyelid there is a tumor, due, probably, to an enlargement of a Meibomian gland. In addition to this and to the tumor over the upper part of the sternum, already referred to, there are numerous tumors varying in size from a millet-seed to a walnut, distributed over the body, especially on the trunk, although the arms and legs are by no means free from them. They are, for the most part, situated beneath the skin, and are hard to the touch; a few, however, project as pedunculated appendages. The axillary and inguinal glands are slightly enlarged, but free from tenderness. No enlarged glands or tumor of any kind can be felt within the abdominal cavity. Neither the spleen nor the liver is enlarged. The patient is very pale and emaciated; his tongue is slightly furred, his appetite is poor, and the nails of his fingers have a decidedly bluish color. The urine contains an excess of the phosphates, but no albumen. Its specific gravity is 1020. His blood, upon being examined microscopically, is found to contain a slight excess of white cells. No disease of his lungs can be detected, but it is impossible to make a

satisfactory examination of them in consequence of the pain he suffers when moved. The heart is healthy."

Feb. 20. "The patient has become very anæmic, and more emaciated than when the last note was made. The paralyzed muscles are wasting, but reflex movements can still be excited in them. The small tumors beneath the skin of the trunk, arms, and legs have increased in size, and this is also true of the large one over the sternum, but it is less tender to the touch than before. A few small nodules can be felt beneath the skin of the face—in fact there is no part of the body where some cannot be detected upon close examination. They are, however, less numerous on the posterior aspect of the body than in front. The feeling of constriction around the body at the base of the thorax still continues, and gives rise to much suffering. The pain is much increased upon movement. A bed-sore has formed over the sacrum, in spite of every precaution to prevent it."

The notes after this, although taken almost daily, merely show that the disease progressed from bad to worse until death released our patient from his sufferings on May 4th, 1874, or very nearly five months after the manifestation of the first serious symptoms, and a year after the enlargement of the cervical glands was first perceived. His urine, which had to be drawn off twice daily, became just before his death ammoniacal and bloody. Other bed-sores formed. During the whole of his illness he preserved possession of his intellectual faculties, and was wonderfully cheerful. Under the impression that the paraplegia was due to myelitis, he had been at first ordered ergot with iodide of potassium, but the former produced nausea, and was, therefore, soon suspended. The latter was continued for some time, but was finally replaced by the syrup of the iodide of iron. Hypodermic injec-

tions of morphia were freely given throughout the whole of his stay in the hospital, and gave him much relief from his sufferings.

Some time before the patient's death a small tumor was removed from beneath the skin of the abdomen, and submitted to microscopical examination, when it was found to be a lymphadenoma.

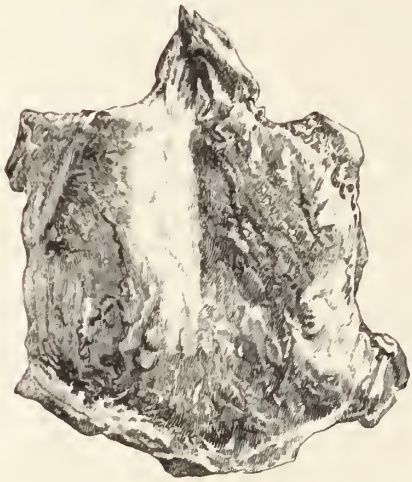
Shortly after I assumed charge of the case, I directed that the state of the temperature, respiration, and pulse should be noted daily, and although the record which has been preserved is not quite so full as I could wish, it shows that there was a slight tendency to a febrile exacerbation at night.

	A. M.			P. M.		
	Temp.	Resp.	Pulse.	Temp.	Resp.	Pulse.
Feb. 13	98°	24	100	101°	18	60
" 14	98	18	100	100	18	88
" 15	98	18	74	101	—	—
" 16	98½	18	86	98	18	86
" 17	97	18	70	99	18	78
" 18	98	18	84	—	—	—
" 26	98½	18	90	98½	18	90
" 27	99	18	70	101	18	84
" 28	99	18	84	101	18	84
Mar. 6	99	—	—	99½	—	—
" 7	98					

The autopsy was made eighteen hours after death. The body was much emaciated. Rigor mortis well marked. Bed-sores existed over the sacrum and the right shoulder blade. A very large number of tumors, varying in size, were observed, scattered over the whole surface of the body, being found on the head as well as on the trunk and extremities. A few of these, not more than three or four, were

pedunculated and took their origin in the true skin; the remainder were more deeply seated, being situated between skin and superficial fascia. At the inner part of the left upper eyelid was a lobulated tumor of the size of a hazelnut.

Fig. 1.



The cervical glands of the right side were enlarged, forming a tumor equal in size to a small orange. Over the upper third of the sternum, and extending to the notch above and to the cartilages of the ribs on the sides, was the largest tumor in the body (Fig. 1), measuring from three and one-half to four inches in diameter, and raised above the surface at least one and one-half inches. It was found to penetrate the bone, and was nearly of the same dimensions beneath the sternum as above it. The venous and arterial trunks of the neck were in contact with it in the anterior mediastinum. The other tumors, which varied in size from a small pea to half a walnut, were distributed over the body as follows: On face, twenty-four; on front of chest, seventy; on front of abdomen, sixteen; on back, twelve; on right arm, eighteen; on right leg, thirty-three; on left arm, forty-three; on left leg, twenty-three; making in all two hundred and thirty-nine.

Head.—The skullcap was moderately thin. The membranes were not congested, and presented, in every respect, a normal appearance. There was no effusion. Twenty tumors, the largest the size of a small filbert, the smallest that of a grain of wheat, were counted scattered over the surface of the brain. The largest were distributed as follows: Anterior lobes, upper surface, right side, three; left, one; lower surface, right side, two; left, one; middle lobe, base, right side, one; left, two; cerebellum, on under surface of right lobe, one; on upper surface of left lobe, one. The smaller tumors were seated in the upper and lateral surfaces of the right posterior lobe of the brain. They so closely resembled the brain-substance in appearance, that they would have escaped notice if they had not been specially looked for.

Fig. 2.

Spinal Column.—On opening the chest and removing the thoracic viscera, a tumor was found completely surrounding the bodies of the sixth, seventh, and eighth dorsal vertebræ (Fig. 2), and continuous with this through the intercostal spaces were similar growths occupying the gutters on both sides of the spinous processes, but causing little or no projection posteriorly. The spinous and transverse processes of the vertebræ just mentioned were so soft that they could be

readily cut with a scalpel. Upon removing them the tumor was seen to have penetrated into the spinal canal, where it was adherent to the dura mater. It compressed the spinal cord (Fig. 3), which in this position was less firm than elsewhere. A similar, but much smaller, tumor was found within the canal at the level of the last dorsal vertebra.

Fig. 3.

Chest.—The pleuræ were healthy. There was no effusion into either of the pleural sacs. The lungs contained a large number (as many as three hundred were actually counted) of tumors, similar in appearance to those in other parts of the body. Their average size was about that of a large pea, but a few were considerably larger than this. They were seated immediately beneath the surface of the lungs as well as in their interior, which in other respects presented a healthy appearance. But one tumor was detected taking its origin

from the parietal pleura, and that one was situated on that part of it in contact with the pericardial sac. The pericardium was smooth, no tumors existing either on its parietal or visceral layers. The sac contained about two ounces of clear straw-colored serum. The heart was normal in size and in consistence, but was pale in color. Its cavities contained both black and white clots, which extended into the great vessels. The valves were healthy.

Abdomen.—There was no trace of peritonitis, and no effusion into the peritoneal sac. Small tumors, about the size of a grain of Indian corn, were scattered over the peritoneal covering of the intestine. The mesenteric glands were much enlarged and prominent, but no other glands within the abdominal cavity were diseased. The omentum was entirely free from fat. The rectum was distended and filled with light-yellow-colored fecal matter. The liver was normal in size, color, and consistence, being entirely free from tumors, either on its surface, in the connective tissue of the fissure, or in its substance. The gall-bladder contained green-colored bile. The spleen was not enlarged, and presented an absolutely healthy appearance. The supra-renal capsules were enlarged; the left one contained a glandular growth. The kidneys were normal in size; their tissue was firm and dense. On the surface of one of them was found a small growth pressing into the substance of the organ. The connective tissue surrounding the kidneys held in its meshes numerous similar tumors. The capsules were easily removed, leaving a smooth surface, which, however, showed a slight tendency to lobular depression or contraction. The pelves and ureters were filled with a gritty sabulous deposit from the urine. The walls of the bladder were thickened; its mucous membrane was rough, and in places covered with calcareous matter; in other places it was discolored by ecchymoses. The urine contained in the viscus was bloody.

Bones.—A small piece of the left femur, about its middle, was removed for the purpose of examining its medullary cavity. This was filled with a yellowish-green gelatinous

substance. The body having been necessarily much mutilated by the examination, it was deemed unnecessary to remove the enlarged cervical glands, or the tumor of the eyelid.

Sections of tumors from various parts of the body, a little of the marrow of the femur, and fragments of the vertebræ were sent immediately after the autopsy to Dr. J. G. Richardson, the microscopist to the hospital, and the following is his report:—

No. 1620 CHESTNUT STREET,
May 5th, 1874.

J. H. HUTCHINSON, M.D.

DEAR SIR: The specimens sent me, by your direction, from a patient dying recently in the south room of the Men's Medical Ward, at the Pennsylvania Hospital, comprised portions of the tumor of the brain and of that of the spine, fragments of the spleen, kidney, and supra-renal capsule, a section of lung containing six or eight small tumors, and some of the marrow from a long bone, all preserved in excellent condition, in solution of hydrate of chloral.

Of these the fragments of spleen and kidney appear to be nearly normal, as also does that of the supra-renal capsule, with the exception of its having undergone marked hypertrophy.

The tumor from the spine is of a yellowish-white color, and rather firm consistence. On examining thin sections, cut in a plane at right angles to the major axis of the growth, and stained with Beale's carmine solution, I find the great bulk of the tumor to be composed of rounded, oval, and somewhat angular cells, about $\frac{1}{200}$ of an inch in diameter, each furnished with a single round or slightly oval nucleus, averaging $\frac{1}{400}$ of an inch across, and containing one or two nucleoli.

These cellular elements are arranged together in groups, sometimes of five to ten or more, sometimes of several hundreds, each group being contained in a roundish, oval, or elongated mesh of connective tissue network, and in many instances being as free from intercellular substance as a pile of paving stones is from mortar.

Near the peripheral portion of the sections these heaps of cells presented a broader and more rounded aspect, whilst towards the central part they assumed a narrower and more elongated shape; thus, it will be seen, closely resembling the follicles and follicular (or medullary) cords, as contained between their trabeculæ, of a lymphatic gland.[1]

Similar examinations of fragments from one of the pulmonary tumors and from that of the brain, afford almost identical results, except that the fibrous stroma seems to bear, in its amount, a smaller ratio to that of the cell elements, than it does in the spinal growth.

Very respectfully yours, etc.,

JOS. G. RICHARDSON.

Appended to this paper will be found references to all the cases I have been able to collect of Adenoid Disease, or as it is called by many "Lymphadenoma;" a better name, since the former implies the existence of a morbid condition of the glands only, whilst in this disease there are lymphatic new formations in parts of the body where they are not usually found, and this is notably true of the case I have reported this evening. I have subjected 58 cases to an analysis, but cannot find one among them in which the disease was so extensively diffused as it was in that of W. M. L. The one which seems to me to approach nearest to it is that reported by Dr. Murchison in the *Transactions of the Pathological Society of London*, vol. xxi., in which, after the death of the patient, a child six years of age, in addition to numerous lymphatic tumors scattered over the body, and in its

[1] Subsequent investigation of the structure of portions from one of the smaller tumors, after hardening the tissue in alcohol and pencilling out very thin sections, showed the almost precise identity in the arrangement of the stroma with that of a lymph-gland, which characterizes the true lymphadenomata. J. G. R.

cavities, there was found a tumor within the cranial cavity, "on the right side of the foramen magnum, close to the junction of the petrous with the occipital bone." Dr. Murchison says in his description "there projected inwards from the dura mater, to which it adhered, a firm lobulated mass, more than half an inch in diameter, of the same morbid material as that found in other parts of the body." With this exception I do not know of any case except that reported by me in which lymphadenomatous tumors have been found within the cranial or spinal cavities.

Attention has been called in the notes to the fact that it was possible to trace the outlines of several glands in the cervical tumor. This has been noticed in other cases. In fact the description given by Dr. Reginald Southey of the sensation imparted to the fingers, in one of his cases, so well applies to that obtained in my own that I shall reproduce it. "Now the feel of the glandular enlargement in this man's neck," he says, "was highly characteristic; you could make out the hypertrophied condition of each separate gland, but they hung together like grapes on a stalk, and were not conglomerated or matted together; they were not fused into a boggy mass, like scrofulous glands; they did not feel knobby and cartilaginous, like scirrhous cancer; they had individually attained larger size, and had a less hard feel than syphilitic glands possess." The sternal tumor seemed lobulated, as if it also was made up of separate masses.

I have spoken of my case as being an unusual one, and it is so in more respects than one. In addition to the freedom from deposits and enlarge-

ment of the liver and spleen, which is rare where the disease is so extensively diffused, there was little involvement of the axillary and inguinal glands. But its most remarkable feature was the paraplegia, which was complete, and gave rise to the impression in some of those who saw the patient that he was suffering from myelitis. In view of the existence of the numerous tumors all over the body, and knowing from previous reading that these tumors may be developed in any part of the body, I had little difficulty in coming to the conclusion that the paralysis was caused by the pressure of a lymphoid tumor upon the spinal cord, and the autopsy confirmed the accuracy of my diagnosis. Knowing also that the bones are frequently diseased in this affection, I thought it not improbable that we should find disease of the vertebræ, which the post-mortem examination likewise showed to exist; but the symptoms pointed less positively to this than to a tumor. There was at no time, it will be remembered, any deformity of the spine.

There is the same difficulty in discovering the cause of the disease in this case, as in almost every other reported case. Virchow believes that the cervical enlargement, which generally ushers in the disease, is preceded in many cases by otorrhœa, and Jaccoud thinks with Mosler that it often may be traced to frequent attacks of pharyngitis; but while a few of the authors, whose papers I have been able to consult, refer to these opinions, none of them report cases which at all substantiate them. In my case there was a history neither of otorrhœa nor of pharyngitis, nor of anything else which would be likely to have a determining

influence in the production of this disease. It is true that the patient's mother was affected for many years with enlargement of the cervical glands; but the fact that she died finally of phthisis seems to justify the conclusion that this was due to scrofula, rather than to the disease under consideration. Moreover, among the fifty-eight cases I have collected, there is not one in which the reporter believes that hereditary influence had any share in the production of this disease. The reports of the cases in the Transactions of the London Pathological Society are not always very full, and it is, therefore, possible that I have been led into error by them, but I can find in only three cases a positive statement that a predisposition to either phthisis or tuberculosis existed; and in only seven did the post-mortem examination show the presence of either of these conditions, and in a few of these it is probable that these tumors were really lymphadenomata. This is a result different from what I had anticipated, for, believing as I do that tubercle is a minute lymphadenoma, I had expected to find in most of the cases a marked predisposition to tuberculosis.

The examination of the blood of my patient, shortly after he came under my care, showed a slight excess of white corpuscles. Unfortunately it was never repeated during his life, and the blood which was collected after his death was, through a misunderstanding, allowed to undergo decomposition before it was sent to the microscopist. It became, however, as gelatinous as pus does, when liquor potassæ was added to it, and it is, therefore, most probable that there was leucocythæmia up to the very last. M. Jaccoud attempts to explain the absence of an

excess of white cells in this disease in the following way: During the early stages of the disease the lymphatic glands are enlarged by the hypertrophy of the lymphatic elements themselves, and in consequence of the increased functional activity which results from this, an excessive number of white cells is produced which find their way into the blood. Later there is superadded to the hypertrophy of the glandular tissue an increased production of connective tissue, the effect of which is finally to produce constriction of the efferent ducts, so that the white corpuscles no longer find their way into the blood because the way is closed against them. This theory, although attractive when first presented, must, it is believed, be abandoned in view of the fact that, in many cases, leucocythæmia is present at no time during their whole course. It appears to be a very infrequent symptom, for we find it said to have been present in only six cases, and in four of these not in a marked degree. In the greater number of cases it is not even alluded to, but in eleven it is stated to have been absent.

No treatment has been shown to have the slightest influence in arresting the course of this disease; although, of course, various plans have been proposed.

I have subjected fifty-eight cases of this disease to an analysis, the results of which will probably not be without interest to the Fellows of the College.

ANALYSIS OF FIFTY-EIGHT CASES OF ADENOID DISEASE.

Sex.—Males, 40. Females, 18.[1]

Age.—The youngest patient was 3½ years old.[2]
" oldest " " 68 years old.[3]

Under 5 years of age	2
Between 5 and 10 years of age,	4
" 10 " 20 " "	12
" 20 " 30 " "	15
" 30 " 40 " "	9
" 40 " 50 " "	4
" 50 " 60 " "	5
over 60 " "	3
Age not definitely given in	4
	58

The liability to the disease would, therefore, appear to increase up to thirty; and after that age to diminish.

Duration of Illness.—One patient is said to have died in less than a month after the appearance of the first symptoms; but it is possible the disease had been latent for some time. On the other hand, another patient was living ten years after the commencement of his illness. Of forty-two cases analyzed for this purpose, the duration was found to have been—

In	8	under 6 months.						
"	6	over 6 months	and	under	1	year.		
"	15	"	1	year	"	"	2	years.
"	6	"	2	years	"	"	3	"
"	4	"	3	"	"	"	4	"
"	3	"	4	"				

[1] It is difficult to explain this large preponderance of males among the subjects of this disease. It has been noticed by authors.

[2] Dickinson, Trans. Path. Society of London, vol. xxii. p. 287.

[3] Trousseau, Clinique Médicale, t. iii. 1865.

The duration of the disease does not appear to bear any relation to the age of the patient. While in some of the younger patients the disease has advanced rapidly to a fatal termination, in others its course has been exceedingly slow. They are also less likely to be cut off by some intercurrent affection, as peritonitis or pleurisy, than those more advanced in years.[1]

As regards the frequency with which the various systems of *glands* were involved, the following table shows that the—

Cervical glands were enlarged in					.	.	.	38	cases.
Mesenteric	"	"	"	"	.	.	.	18	"
Mediastinal	"	"	"	"	.	.	.	31	"
Lumbar	"	"	"	"	.	.	.	25	"
Inguinal	"	"	"	"	.	.	.	19	"
Axillary	"	"	"	"	.	.	.	18	"
Iliac	"	"	"	"	.	.	.	10	"

In 38 cases the condition of the *spleen* was as follows:—

In 4 cases the spleen was simply enlarged.

In 27 cases the spleen was enlarged and contained lymphoid tumors.

In 1 case the spleen was atrophied, but contained tumors.

In 6 cases the spleen was unaltered.

In 5 other cases the appearances which it presented are not noted.

In 35 cases the condition of the *liver* was as follows:—

In 15 cases the liver was healthy.

In 4 cases the liver was simply enlarged.

In 10 cases the liver was enlarged, and contained lymphatic growths.

In 6 cases the liver was small but contained growths.

In 8 cases the appearances it presented are not recorded.

The *sternum* was involved in three other cases besides the case reported by me. The size to which the enlarged

[1] A woman, aged fifty-nine years, whose case is reported by Dr. Church, in the Trans. Path. Soc., London, vol. xx. p. 375, lived less than three months after appearance of first symptoms.

glands may attain is shown by the fact that in the case reported by Bonfils the glands found in the pelvis weighed 3 kil. 620 grammes, or very nearly 8 lbs. In four cases enlarged glands in the axilla have been removed by operation, and apparently successfully.[1]

[1] Hillmann, Transactions of Path. Soc. of London, vol. x.; Campbell De Morgan, Ibid., vol. xxii.; Brodie, referred to by Ogle, Ibid., vol. xi., J. Croft, Ibid., vol. xxiv.

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CASE

OF

FRACTURE OF THE NECK OF THE SCAPULA.

By

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[Read November 4, 1874.]

This rare accident occurred in a boy five years old, who had been struck by a falling door, receiving a contused wound just in front of the right ear and an injury of the right shoulder, the precise nature of which does not seem to have been at first recognized. When I saw the case, on the third day, there was a good deal of pain and tenderness with moderate swelling, but very little deformity. Careful examination showed that there was no fracture of either the humerus or the clavicle, nor of either the acromion or the coracoid process; but the latter appeared to move with the head of the humerus, and, by grasping the neck of the scapula between the fingers laid upon the shoulder and the thumb thrust firmly into the axilla, deep-seated crepitus was elicited upon the arm being forcibly rotated. The treatment consisted in maintaining the arm in the "Velpeau position" by means of broad adhesive strips and a bandage, and a satisfactory cure was effected in the course of four weeks. Though the diagnosis in this case lacks, of course,

the confirmation of dissection, the symptoms are, I think, sufficiently characteristic to warrant its being added to the examples of fracture of the neck of the scapula, or, which, perhaps, would be a better name, fracture through the supra-scapular notch, recorded by Cooper and other writers.

ON A

NEW OPERATION

FOR

CERTAIN CASES OF CLEFT PALATE AND BIFID UVULA.

By

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[Read November 4, 1874.]

I DESIRE to say a word in regard to some clinical experience I have had with cleft uvula and partially cleft velum.

It may be observed that in those cases where the cleft is complete in both hard and soft palate, the gravity of the catastrophe at once discovers itself; the serious disturbance of the process of nutrition consequent upon the arrest of the development of the organs of deglutition occasions immediate apprehension as to the capability of the new-born child to maintain life.

This is not the case, however, when the cleft exists only in the uvula and in the velum. In these cases a vacuum is readily formed between the tongue and the hard palate, into which the milk from the mother's nipple easily flows; and although this space is a small one, yet what is lost in volume is made up by the vivacity with which sucking and swallowing are performed, the child soon adapting itself to its condition;

and there generally is found to be no serious disturbance in the process of nutrition.

It is, for the most part, at a later date that relief is asked for, when the function of articulation, into the performance of which the uvula and the velum enter so largely, is found to be seriously interfered with.

At the present time, the operation for closing the cleft in the soft palate, as revived by Roux, and practised by Dieffenbach, Warren, and others, and materially improved by Sir W. Fergusson, consists in dissecting off the margins of the fissure, bringing the edges together, and holding them in apposition by suture, and in dividing the tensor and levator palati, and the palato-pharyngei muscles, in order to relieve tension, and place the parts as much at rest as possible, until union takes place, when the sutures are to be removed.

There are frequently cases met with, however, in which each half of the split uvula and velum is large and thick, and in which the cleft does not extend entirely through the velum up to the hard palate. In such cases I have to recommend a different mode of procedure, one in which no suture is used, and with which, in the two cases I have had, I succeeded perfectly well.

The first case was in May last, in a boy, N. Y., aged ten years. He came from Western Virginia; was healthy in every respect, and allowed me to touch his palate without any discomfort to himself. The uvula was thick, and the whole palate was large, the cleft extending a little above, I thought about a fourth of the way through, the velum. I had hardly finished my examination before I thought it possible to prac-

tise on this palate what I had seen Nélaton perform in a case of hare-lip, namely, to make an incision from a little below the middle of the right half of the uvula, on one side (Fig. 1, A), and carrying the bistoury up to a point above the arch of the fissure, and then turning the bistoury, to bring it down to a corresponding point in the uvula of the opposite side (B).

Fig. 1.

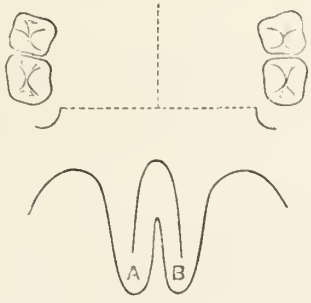
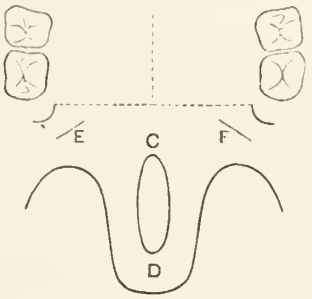


Diagram of bifid uvula. The incision is represented by the line A B.

Fig. 2.



Bifid uvula after operation; C D, oval wound left to heal by granulation. E F, incisions for division of palatine muscles.

The column of flesh on either side of the fissure, now liberated by this incision, turns on its attached pedicle, or falls from the arch, leaving a long uvula with an oval opening (Fig. 2, C D), in its base.

This operation having been practised in the case referred to, in a few days granulations sprang up, and the parts contracted. A day or two later, when the upper part of the wound began to widen, I divided with a double-edged knife the tensor and levator palati muscles, as recommended by Sir W. Fergusson (entering the knife for this purpose as indicated by the lines E F, Fig. 2), thus removing all tension, when the upper edges of the opening approached the median line; and, under the application

of a little nitrate of silver, cicatrization and narrowing of the entire opening rapidly ensued.

Five weeks after the operation the patient left the city with a very small opening; and this fall I have been informed of its entire closure. He has now a good soft palate, his articulation is almost entirely restored, and I make no doubt but that the practice of a few more months will completely remove all traces of his deformity.

My second case was from Maryland, not far from Cumberland. It was that of a little girl, Mary B., aged eight years. I operated as in the case of the boy; and in ten days afterwards, viz., on the 2d of October, she left with her parents for home. I have since learned that cicatrization was nearly complete, there still being, however, a hole the size of a small knitting-needle. I make no doubt of its entire closure being ultimately obtained.

The happy result in these two instances impels me to the belief that in those cases which present a similar condition of the parts, viz., where the velum and uvula are large and thick, and the cleft does not extend through the velum up to the hard palate, and yet when we find articulation materially defective on account of the cleft, this operation may be practised with great advantage.

There is no loss of any portion of the soft parts; there is no risk of bruising the parts as in the application of the suture, for no sutures are used; and the operation itself can be readily and safely performed.

ON THE

OPERATIVE AND CONSERVATIVE SURGERY OF THE LARGER JOINTS.

I. Excision of the Elbow.

By

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[Read January 6, 1875.]

In this paper, and in others which I hope to bring before the College at some future period, I purpose to communicate the results of my individual experience in the treatment of the injuries and diseases of the larger articulations of the human body, and more particularly in their treatment by operative measures, whether by amputation — the "humane operation," as some of the older military surgeons worthily called it—or by excision, that triumph of conservative surgery for the revival of which the world is so largely indebted to Sir William Fergusson. In the following pages I shall briefly narrate the various cases, eight in number, in which I have had occasion to resort to *excision of the elbow-joint*, and shall append a few practical remarks upon the rules which should guide the surgeon in determining to resort to this mode of treatment, upon the steps of the operation itself, and upon the after-management of patients upon whom the operation has been performed:—

Case I. *Arthritis of Left Elbow in an Elderly Man; Excision; Death from Exhaustion on Thirty-third Day.*—This case (which has already been reported in the *American Journal of the Medical Sciences* for January, 1868, p. 42) occurred in a man, B. F., fifty-six years of age, a native of this country, and a blacksmith by occupation, who entered the surgical wards of the Episcopal Hospital on January 26, 1867. He had been sent into the medical wards the day before, under the impression that he was suffering from rheumatism, and the true nature of his affection was not ascertained until the visit of the attending physician, Dr. James H. Hutchinson, upon the next morning. When I first saw the patient his condition was as follows: There was great swelling about the left elbow, and the joint evidently contained a considerable amount of fluid. There was not much pain about the part, and no grating perceptible upon motion of the articulation. The patient's general state of health was fairly good, though he was feeble and looked much older than most men of his age. This was accounted for by the fact that for some years before entering the hospital he had led a life of much hardship, and it was hoped that under more favorable circumstances an opportunity would yet be afforded for recovery through the efforts of nature alone. For nearly six weeks there seemed to be some improvement, with occasional relapses, but at the end of that time it became evident that the ligamentous structures of the joint were becoming rapidly disorganized, and distinct grating on rubbing together the opposing joint surfaces showed that the articular cartilages were undergoing absorption, while the patient's constitutional condition began to deteriorate coincidently with the progress of the local disease.

When it became manifest that the elbow-joint was hopelessly disorganized, it became a question whether the limb should be sacrificed, or whether an effort should be made for its preservation by resorting to excision. The latter mode of treatment was adopted on account of the limitation of the diseased action to the joint itself, and because, in the unfavor-

able general condition of the patient, it did not appear that an amputation would be much less hazardous than an excision.

The patient was accordingly brought under the influence of ether on March 20, 1867, and, the joint being fairly exposed by an H-incision, an inch of the lower extremity of the humerus, and an inch and a quarter of the ulna, with the head of the radius, were removed by means of a "Butcher's saw," and a considerable amount of disorganized tissue clipped away from the floor and sides of the wound with the large knife-bladed forceps described by the same eminent surgeon. A good many ligatures were required to arrest the hemorrhage from small vessels which had been enlarged by inflammatory action, and, the edges of the wound having been brought together with points of the lead suture, the limb was placed in a well-fitting fracture-box and the patient restored to his bed.

The relief from pain after the operation was most marked, and for a week or ten days the progress of the case was as favorable as could be wished; but from this time, though with occasional improvement, the patient gradually failed, and death, which occurred on April 22, seemed due to exhaustion and general diminution of vital power rather than to any positive complication or sequel of the operation. Though the soft parts had united to a considerable extent, there was no attempt at union between the ends of the resected bones, and an autopsy showed that there was slight ulceration of the mucous lining of the bladder, possibly following the use of the catheter, which it had been necessary to employ frequently during the last period of the patient's life.

Though excision is, probably, a less serious operation when applied to the elbow than when to any of the other large articulations, yet when practised in persons past the middle period of life it must always be looked upon as a measure fraught with no inconsiderable risk. Thus of fifteen cases of excision of

the elbow-joint for disease in persons of forty-five years and over, collected by Dr. Hodges, of Boston, six proved fatal (two after amputation), while recovery was obtained in only nine. This rate of mortality (40 per cent.) is, no doubt, larger than that which attends amputation performed under similar circumstances, but the result of a successful elbow-joint excision is so satisfactory, enabling the patient to return to his ordinary occupation—a most important matter for a laboring man—that the surgeon is, in my judgment, fully warranted in recommending the graver operation in suitable cases.

Case II. *Excision of the Right Elbow-Joint for Disease in a Young Adult; Death from Tuberculous Meningitis.*—The portions of bone excised in this case were exhibited in their recent state before the Philadelphia Pathological Society, and a notice of the case appeared in Vol. III. of the *Proceedings* of that body (p. 157). The patient, J. D., a man twenty-five years of age, was admitted to the Episcopal Hospital on December 1, 1869, and first came under my care in January, 1870. The right elbow was the joint affected in this case, and the patient had been disabled by its condition for five or six months. The origin of the disease could not be ascertained, but the peculiar globular shape of the part, the painless character of the swelling, and the degree to which passive motion could be carried, rendered it probable that the affection had begun in the synovial membrane and had thence spread to the ligamentous and cartilaginous structures, and that it was in fact an example of the condition described by Barwell as *strumous*, and by Athol Johnstone as *scrofulous synovitis*, and which I have myself ventured to call *gelatinous arthritis*.

No benefit having resulted from careful treatment by rest and moderate extension in the hands of the gentleman who had had charge of the case before it came under my care, and being fully satisfied that the disease had progressed too far

to admit of recovery without operative interference, I determined to resort to excision, and accordingly, on January 27, 1870, the patient having been placed under the influence of ether, I opened the joint by a single longitudinal incision on

Fig. 1.

its inner and posterior side, and, turning out the bones, removed with Butcher's saw their articulating extremities, taking a mere shaving from the head of the radius, which was not diseased. I then clipped away the disorganized soft tissues, closed the wound with the lead suture, and placed the arm at rest on a well-padded internal angular splint.

Fig. 2.

The accompanying illustrations (Figs. 1 and 2) show the condition of the articulating surfaces of the humerus and ulna. The articular cartilage has disappeared from the radial

head (capitellum) of the former and from the greater sigmoid cavity of the latter bone, and at these spots the osseous tissue is seen to be exposed and carious.

For several months after the operation the patient's condition was satisfactory, and there appeared to be every prospect of the case terminating successfully; but, during the month of May, he underwent a severe attack of traumatic erysipelas, and shortly after convalescing from this affection became wildly delirious, with fever, intense headache, screaming, and the presence of a well-marked *tache cérébrale*, and died on June 7, nearly nineteen weeks after the operation. A *post-mortem* examination showed, as was expected, that the cause of death was tuberculous meningitis.

During the illness which immediately preceded this patient's death, it became a question whether his condition was one of tuberculous meningitis or of pyæmia, which was naturally looked for as a sequela of the erysipelas from which he had been suffering. I diagnosticated the former affection from the symptoms enumerated in the history of the case, together with the absence of rigors and of constitutional prostration. The case is interesting as bearing upon the suggestion of Dr. Burdon Sanderson, that pyæmia and tuberculosis are analogous if not allied conditions.

With regard to the structural changes met with in this and similar cases, I see no reason to doubt that Barwell is correct in regarding the so-called "pulpy" or "gelatiniform degeneration" as essentially the same as the granular change met with in cases of ordinary synovitis, the difference being that in the latter affection this granulation tissue undergoes further development, whereas in the cases now under consideration it remains in a rudimentary state. In fact it occasionally happens that in one part of a joint the syno-

vial tissue is found to be entirely replaced by organized intra-articular adhesions, while in another part of the same joint it may present the characteristic appearances of the gelatiniform change. The name which I have applied to this affection, viz., *gelatinous arthritis*, seems to me to be preferable to any other which has been suggested, as referring to the peculiar gelatinous appearance of the joint structures observed in these cases, and as indicating that, when uninterfered with by treatment, *all* the tissues of the joint sooner or later became implicated.

Case III. *Excision of Right Elbow; Recovery.*—Josephine K., aged seven years, was admitted to the Children's Hospital on Oct. 16, 1870, suffering from arthritis of the right elbow, the result of an injury received some six months previously. The joint was painful and tender, hot, and swollen, particularly at its radial side. After a fair trial of the effect of rest, with the administration of tonics and the topical use of soothing applications, excision was resolved upon, and on Dec. 19, 1870, the patient having been etherized, the operation was performed, the joint being laid open by a single longitudinal incision, and the articulating extremities of the several bones removed with the "Butcher's saw." The joint was found to be full of pus, which gushed out as soon as the knife entered the articulation, the cartilages were eroded (especially over the head of the radius), and there was incipient caries of the subjacent bones. No ligatures were required, and, the edges of the wound having been brought together with leaden sutures, a strip of oiled lint was applied, and the limb placed at an angle of about 120° in a felt splint, which, however, bred maggots in the dressings, and was therefore replaced by a simple wooden splint on the third day. The after-progress of the patient was satisfactory; an abscess which formed in the neighborhood of the excision wound was opened on Jan. 31, 1871; and in the following March the

splint was left off, and a simple soap plaster and bandage substituted. The motions of pronation and supination were by this time fully restored, and there was slight power of flexion and extension, which could doubtless have been materially increased had the patient persevered in systematically exercising the limb. This, however, was not done, and anchylosis as regards flexion and extension eventually occurred. The patient was discharged from the hospital on April 15, 1872, but the last occasion upon which I saw her was in February, 1874, at which time the condition of the resected arm was very satisfactory, the limb though stiff being extremely useful, and the motions of pronation and supination being, as before remarked, perfectly restored.

In each of the cases already recorded the operation of excision was rendered necessary by the existence of disease of the joint of a more or less chronic character: in the following case the operation was performed for the results of a recent injury.

Case IV. *Compound Fracture and Dislocation of Right Elbow-Joint in an Adult; Excision; Death on Seventh Day from Delirium Tremens.*—The subject of this case was a teamster, J. C., an Englishman by birth, and fifty-one years of age, who on March 27, 1871, was thrown from his wagon against a curb-stone, sustaining such severe injuries as to necessitate his being brought to the Episcopal Hospital, where he was admitted shortly after the occurrence of the accident. Upon examination it was found that the patient had received a compound forward dislocation of the right elbow, with fracture of the olecranon; he strenuously objected to amputation, and, as the injury was limited to the parts entering into the articulation, it was determined to make an effort to save the limb by excision, though the intemperate habits of the patient (he confessed to half a gallon of beer daily) rendered the prognosis of the case less favorable than it would have been under other circumstances.

Ether having been administered, the joint was excised in the usual way, viz., by making a single longitudinal incision between the olecranon and internal condyle, and, having turned out the ends of the bones, sawing them off with Butcher's saw. Two ligatures were required, a tent of oiled lint was introduced and the extremities of the wound closed with sutures, and the whole was then wrapped with a cloth dipped in laudanum, and the limb placed at rest on an obtuse angled Physick's splint. The patient did well for four days, when he was attacked with delirium tremens, which carried him off on April 3d, just one week from the date of the operation.

Such a case as that just narrated can prove nothing either for or against the operation of excision as a means of treating severe recent injuries of the elbow-joint. The arguments advanced by Mr. Hutchinson, of London, and by our fellow-countrymen Dr. Hamilton and Dr. Hodges, seem to me to have established the propriety of resorting to excision, in these cases, in preference either to amputation or to expectant measures. Moreover the observation of a large number of cases in which delirium tremens has occurred as a complication of severe surgical injuries, has led me to believe that the prognosis under such circumstances depends more than upon anything else upon the constitutional state of the patient, and particularly upon the condition of the kidneys and other internal organs; and hence that the risk to life in such a case is not materially influenced by the nature of the operation, if any, which has been performed.

Case V. *Excision of Left Elbow-Joint for Arthritis; Recovery.*—The patient in this case was a boy, R. A., aged ten

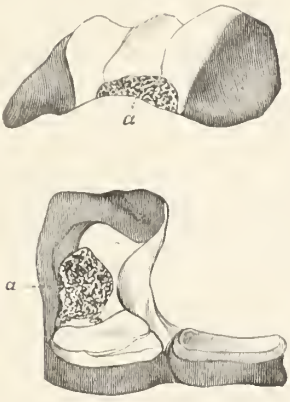
years, a native of Scotland, who was admitted to the Episcopal Hospital on January 11, 1872, suffering from arthritis of the left elbow, the result of an injury received one year previously. Excision was performed in the usual way (the joint being opened by a single incision made in the direction of the long axis of the limb) on January 18th. Five ligatures were required, the excision wound was dressed with oiled lint, and the arm placed on an internal angular splint. The exsected parts presented a good example of ulceration of the articular cartilages with incipient disease of the underlying bone. The splint was left off in the course of a few weeks, and care taken to prevent the occurrence of anchylosis by the systematic use of passive motion. The result of the case was in every respect satisfactory, the patient leaving the hospital on June 1, 1872, with the wound firmly healed, and with the normal motions of the part quite restored.

In the next case I abandoned the use of the splint at a still earlier period, and this, as I shall hereafter point out, I consider one of the most important parts of the after-treatment of these cases.

Case VI. *Excision of the Left Elbow-Joint in a Young Child; Splint left off after the Eighth Day; Recovery.*—The subject of this case, G. P., a boy four years of age, entered the Children's Hospital on Aug. 8, 1872, suffering from disease of the left elbow-joint of one year's duration, believed to have originated from an injury, though the history of this was not very clear. Excision was performed in the usual manner on Aug. 12th, two ligatures only being required, and the wound being closed with sutures, dressed with oiled lint, and placed on a splint; this, however, was dispensed with after the eighth day, by which time the wound had united and the parts were measurably consolidated, the limb from this time forward being simply supported in a broad sling. The condition of the exsected parts may be seen from the accompanying illustrations (Figs. 3 and 4); the principal

seats of disease were the base of the trochlea and the greater sigmoid cavity of the ulna, at which points (*a*, *a*) the cartilage had disappeared and the subjacent bone was carious and

FIGS. 3, 4.



deeply eroded. The progress of the case after the operation was satisfactory; an abscess which had formed in the neighborhood of the joint was opened on Feb. 28, 1873, and the

FIG. 5.

patient left the hospital on May 28th, of the same year. A photograph, from which the annexed illustration (Fig. 5) has

been copied, was taken in October, 1873, at which time the wound was firmly healed, the arm strong, and the motions of the part perfect in every respect.

In the next case the patient made a good recovery as far as the operation was concerned, but perished from the effects of constitutional disease nearly seventeen months subsequently.

Case VII. *Excision of the Right Elbow-Joint for Destructive Disease, the Result of Hereditary Syphilis; Recovery; Death from Syphilitic Disease of the Brain.*—The patient in this case was one of those unfortunate children of whom we see so many in surgical practice among the poor of large cities, who enter upon life bearing about them the seeds of death, and who after a few years of suffering perish miserably, the victims of their parents' misconduct. J. S., a boy six years of age, entered the Children's Hospital on Sept. 4, 1872, suffering from hereditary syphilis in an aggravated form. The record at the time of his admission shows that he had then necrosis of the left radius, and of the lower jaw, with severe osteitis of the right humerus, extending to the lower epiphysis of the bone and threatening the integrity of the elbow-joint. A day or two after admission, a superficial exfoliation was removed from the radius, and on Sept. 9th, the patient being etherized, a large sequestrum was taken from the jaw, the portion removed extending to the articulation of the left side, and constituting about one-third of the lower maxilla. Under careful nursing and constitutional treatment, the patient's general condition now improved, and the jaw and left arm healed; the state of the right arm, however, became steadily worse, and in January, 1873, it became evident that the elbow-joint was hopelessly diseased. Excision was accordingly resorted to on January 13th, the operation being performed in the usual way, the wound dressed with oiled lint, and the limb laid upon a splint, which, however, was dispensed with as soon as the parts had become

sufficiently consolidated. The progress of the case, so far as the operation was concerned, was satisfactory, the wound healing well and the patient regaining considerable use of the limb; but fresh evidences of constitutional syphilis were not slow to manifest themselves. Gummatous tumors, which rapidly ulcerated, formed on the arm, on the shoulder, and on the side of the chest; the *upper* jaw became necrosed, and in October about one-third of its alveolar border was removed; finally, in June, 1874, symptoms of cerebral disease were developed, the patient lying in a stupor unless roused, when he was delirious, but without excitement; and in spite of the administration of large doses of iodide of potassium, death preceded by coma took place on June 7th. No *post-mortem* examination was permitted, but there can be little doubt that intra-cranial syphilis was the cause of the fatal issue.

The next case, and the last to which I shall refer in this paper, is illustrative of a condition perhaps more often met with in the knee than in the elbow, but which, when occurring in either situation, may, in children at least, be treated by excision with the most gratifying results.

Case VIII. *Excision of the Left Elbow-Joint for Partial Anchylosis with Recurrent Arthritis; Recovery.*—This case occurred in a German boy, C. K., six years old, who was admitted to the Episcopal Hospital on March 24, 1873. A year before, the left elbow had received an injury, the nature of which was unknown, and for which no treatment had been employed. The joint at the time of the patient's admission was partially anchylosed, tender and painful on motion, with considerable thickening of the soft parts, and a distortion which simulated partial displacement of the radius. The part was constantly getting hurt, and every fresh injury left the limb more crippled than before. Excision was performed in the usual way on March 27th, the

lower epiphysis of the humerus being found to be separated and slightly carious, and the soft tissues of the joint presenting in parts the pulpy or gelatiniform change which has already been alluded to. The after-progress of the case was perfectly satisfactory; all the sutures were removed on April 1st (no ligature had been required); on April 18th, the patient was allowed to get up; by May 17th, the wound was almost healed, and the functions of the part in a great measure restored; and, finally, on Nov. 13th, the patient was discharged from the hospital, cured, the photograph from which the annexed illustration (Fig. 6) is taken having been secured a few days before his departure.

Fig. 6.

This paper has already extended to such length that I must limit the remarks which I have yet to make to the brief consideration of a few important points.

And first, as to the *selection of cases for operation.* The morbid conditions which may call for the operation of excision of the elbow-joint may be enumerated

as follows: Grave wounds of the articulation; compound fractures implicating the joint; compound dislocations; arthritis which has resisted non-operative measures, or which has advanced to the stage of destructive disorganization—and particularly arthritis of the gelatinous variety; fibrous anchylosis when complicated by frequently recurring attacks of inflammation of the joint; and bony anchylosis, when the limb is in such a position as to render it useless to the patient. The operation is, indeed, recommended by some writers in cases of bony anchylosis in a good position; but for my own part I have never felt justified in resorting to it under these circumstances.

It will thus be seen that excision of the elbow may be resorted to with much greater freedom than excision of other large joints; for, on the one hand, the mortality after the operation is so moderate, that, when the disease or injury is limited to the joint-structures, excision should be almost invariably preferred to amputation; and, on the other hand, the result of a successful excision is so much better as regards the utility of the limb than the cure obtained by the occurrence of anchylosis (which is often the best that can be hoped for when expectant measures only are employed), that the operation may in many instances be resorted to with propriety, when, in the case of the knee, for instance, no interference would be thought of.

The chief contra-indications to excision of the elbow have regard to the *age* of the patient and to his *constitutional condition*, particularly in respect to the existence or non-existence of visceral disease.

To illustrate the influence exercised by the *age* of the patient upon the result of the operation, I have recast Hodges's table of 119 cases of excision of the elbow for disease of the joint, in such a way as to show the mortality at different periods of life:—

Age.	Recovered.	Died.	Amputated.	Not terminated.	Total.
Under 10	3	1	2[1]	...	6
10 to 20	27	3	2[1]	...	32
20 to 30	28	3	6[1]	2	39
Over 30	26	7	5[2]	...	38
Not stated	3	1	...	...	4
Aggregate	87	15	15	2	119

From this table it is seen that while the mortality for all ages under thirty is but about 9 per cent. (77 cases, 7 deaths), the mortality for all ages over thirty is almost 24 per cent. (38 cases, 9[3] deaths); and even between the ages of twenty and thirty, the increasing gravity of the operation is manifested by the large number of cases in which it was found necessary to resort to amputation as a means of saving life.

The *constitutional condition* of the patient exercises a very important influence on the result of the operation. There is perhaps less immediate risk attending an excision of the elbow than an amputation of the arm, on account of the comparative freedom from hemorrhage in the case of the first-named operation; but the much longer period required for convalescence, after excision, not only exposes the patient necessarily

[1] Recovered after amputation.

[2] Two recovered; two died; result of one not mentioned.

[3] This includes the two cases which terminated fatally after amputation.

during a longer time to the inroads of what are often, though improperly, called hospital diseases (erysipelas, pyæmia, etc.), but gives opportunity for the development of visceral diseases, especially tuberculous and amyloid degeneration, or for their aggravation if already in existence.

Hence, before determining to resort to excision of the elbow, particularly in the case of an adult, the surgeon should carefully inquire into the patient's constitutional condition, and especially into the state of the lungs, liver, and kidneys; should there be reason to suspect serious disease of any of these organs, the operation of excision would be so far contraindicated, and, if under these circumstances any interference should be required, preference should as a rule be given to amputation.

A few words must suffice for what I have to say as to the *steps of the operation* itself. Except in my first case, in which I adopted the H incision of Syme and Butcher, I have uniformly employed (as originally suggested by Park) a single longitudinal incision on the inner and posterior side of the joint. With a little practice this mode of operating is found quite as easy as any other, while it has the great advantage of leaving a linear wound which has no tendency to gape. I have no hesitation in recommending it in all cases, herein venturing to differ from Prof. Hamilton, of New York, who prefers the H incision when the operation is required for traumatic causes.

The length of the incision may vary from two to five inches, according to the size of the arm. Its direction should, of course, correspond with the long axis of the limb, and it should pass on the inner side of the

olecranon, and a little on the radial side of the ulnar nerve. In order to guard against loss of the power of extending the limb, Prof Spence recommends that the triceps tendon should be divided by means of an incision in the form of an inverted ∧, while with the same object Mr. Maunder takes care to respect those fibres of the tendon which are inserted into the fascia of the forearm. Either of these plans may be adopted with good result. Prof. Sayre's plan of leaving the portion of the olecranon to which the tendon is attached, would, I should fear, increase the risk of anchylosis.

I have formerly advised that the olecranon process should be severed with strong cutting forceps at an early stage of the operation, but further experience has convinced me that this is quite unnecessary, and in my more recent cases I have abandoned the proceedure; it, however, undoubtedly renders the operation easier to one who is performing it for the first time.

The points of most importance in the operation are to save the ulnar nerve from injury, and not to interfere with the tubercle of the radius, so as to preserve the attachment of the biceps muscle. In excisions for disease, the nerve need give no trouble, for it is so embedded in inflammatory tissue that it can be readily drawn from its position in the groove between the olecranon and internal condyle, and held to the inner side, and indeed need not be seen during the whole operation; in traumatic cases more difficulty is, of course, experienced, though even here a little care suffices to avoid any untoward accident. Provided that the tubercle of the radius is preserved, the more

bone (within certain limits) that is removed, the better will be the result of the operation; the risk of anchylosis is much greater than that of flail-like union (which I have never seen in these cases), and hence the saw may be used freely, without any dread of interfering with the future utility of the limb.

In the *after-treatment* of a case of elbow-joint excision, the most important point, in my judgment, is to guard against the occurrence of anchylosis; and this may best be done, as I have already indicated, by abandoning the splint at a very early period—as soon as the external wound has united, and the inflammatory swelling which always follows the operation has subsided. Some writers, indeed, go so far as to recommend that no splint at all should be employed, but that the limb should be from the first simply laid upon a pillow. This advice, I must confess, seems to me injudicious, particularly in the case of children: by putting the limb at rest upon a well-padded splint for a week or ten days, the risk of consecutive hemorrhage is greatly diminished, the inflammatory action which follows the operation is lessened, and the part is placed in the most favorable condition for rapid repair.

I shall terminate this paper with a brief reference to the *statistics* of the operation. Heyfelder and Bœckel have tabulated in all 203[1] cases of total and 79 cases of partial excision of the elbow. The result in one of the cases of total excision is not stated, but of the remaining 202, 8 were saved by amputation, while only 24 terminated fatally, giving a death-rate

[1] Incorrectly numbered in Bœckel's translation of Heyfelder's Treatise as 208.

for the operation, as performed for all causes, of less than 12 per cent. If excisions for chronic disease only are considered, the figures are 145 cases with 20 deaths and 7 consecutive amputations, a mortality of over 13 per cent. The 79 cases of partial excision gave 8 deaths and 3 amputations, a mortality of but little over 10 per cent. Hodges's statistics, which though less extended are probably more accurate, give a slightly different result; of 119 cases of excision for disease, 15 terminated fatally and 15 required subsequent amputation, death moreover following in 2 of the latter; these being included in the list of fatal cases, the death-rate is found to be over 14 per cent. It is to be observed, however, that these figures embrace both complete and partial excisions, as well as 16 cases in which it is not mentioned whether the whole joint was or was not removed. If the complete excisions alone are considered, the figures are 82 cases with 7 deaths and 7 amputations (one fatal), the mortality thus being a little less than 10 per cent. On the other hand, 21 partial amputations gave 5 deaths and 3 subsequent amputations, a mortality therefore of nearly 24 per cent. Ollier has laid great stress upon the importance of preserving the periosteum in excisions of the elbow, and has reported 35 cases of the sub-periosteal operation with 30 recoveries and 5 deaths, a mortality of over 14 per cent.

When performed for traumatic causes, the operation, in civil life, would appear to be ordinarily attended with very little risk, 21 cases referred to by Dr. Hodges having given but one death, and that "from causes in no way attributable to the excision."

In military practice the results are not so favorable, 286 terminated cases noted in "Circular No. 6" having given 62 deaths, a mortality of nearly 22 per cent. It is, notwithstanding, in military practice that excision of the elbow has gained some of its most brilliant successes.

SUMMARY OF THE CASES DETAILED IN THE PRECEDING PAPER.

No.	Name, sex, age, etc.	Nature of affection for which operation was required.	Result: duration of treatment after operation.	Remarks.
1	B. F., male, 56, blacksmith	Arthritis of left elbow	Died; 33 days.	Death from exhaustion.
2	J. D., male, 25	Gelatinous arthritis of right elbow	Died; 19 weeks	Death from tuberculous meningitis.
3	J. K., female, 7	Arthritis of right elbow from injury	Recovered; 16 months	Anchylosis as to flexion and extension.
4	J. C., male, 51, wagoner	Compound fracture and dislocation of right elbow	Died; 7 days	Death from delirium tremens.
5	R. A., male, 10	Arthritis of left elbow from injury	Recovered; 4½ months	Normal motions of part restored.
6	G. P., male, 4	Arthritis of left elbow	Recovered; 9½ months	Normal motions restored.
7	J. S., male, 6	Right elbow destroyed by constitutional syphilis	Recovered from operation; died 17 months subsequently	Death from syphilitic disease of brain.
8	C. K., male, 6	Partial fibrous anchylosis of left elbow, with recurrent arthritis	Recovered; 7½ months	Normal motions of part restored.

EXPERIMENTS

ON

THE LARYNGEAL NERVES AND MUSCLES OF RESPIRATION, ETC., IN A CRIMINAL EXECUTED BY HANGING.

By

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[Read February 3, 1875.]

In January, 1875, Dr. S. Weir Mitchell called my attention to a paper by Dr. George Johnson, read before the Royal Medical and Chirurgical Society, Dec. 8, 1874 (*Med. Times and Gaz.*, Dec. 19, 1874, p. 700), "On the Laryngeal Symptoms which result from pressure of Aneurismal and other Tumors on the Vagus and Recurrent Nerves." In this paper Dr. Johnson quotes two cases of bilateral palsy of the larynx observed during life by the laryngoscope, in which the post-mortem showed that the vagus and recurrent nerves of one side only, and not on both sides, were compressed, and he expressed the belief that "pressure on one recurrent nerve, which is an efferent motor nerve, will cause direct unilateral palsy of the larynx, but cannot cause either bilateral spasm or bilateral palsy; pressure on the trunk of the vagus, involving its afferent fibres, may cause both bilateral spasm and bilateral palsy of the

larynx." The reason for this bilateral action he considered to be the intimate connection between the nerve nuclei of the two sides, so that, according to Broadbent's hypothesis, each nucleus possesses bilateral activity. Dr. D. Powell stated that he had obtained similar results in the dog, but called attention to the difference that existed in different animals, and that faradization of the recurrent in the cat produced abduction of the cords, and that Dr. J. Reid had produced bilateral spasm in the dog on galvanizing one recurrent only.

Some years ago Dr. Mitchell had discovered the remarkable chiasm in the recurrent laryngeal nerves in the Chelonia. He had sought it in the cat and rabbit, but had not found it. He had not, however, examined the dog, and these statements of Dr. Johnson, coupled with Dr. Mitchell's former discoveries, prompted the proposal that I should assist him in a few experiments to determine the facts in the dog, and the probabilities in man, of a chiasm of the minuter fibres of the recurrents, which, though not demonstrated anatomically, might yet be proved physiologically.

A few days later, by the courtesy of Dr. F. F. Maury, I was invited to be present at the execution of Frederick Heidenblut, and it occurred to me that here was an opportunity to test the question on man himself, instead of the dog. Accordingly it was arranged that Dr. Carl Seiler should make the laryngeal examinations, while I dissected the nerves and faradized them, according to directions drawn up by Dr. Mitchell. I was also assisted by Drs. Maury, Butcher (the prison physician), T. H. Andrews,

T. G. Morton, and Kirkbride, and Messrs. Garrett and Biddle, medical students.

Heidenblut was hanged at 10.45 A. M., January 20, 1875. After hanging half an hour, his body was cut down and carried into a small room near by, when I dissected the left vagus and recurrent laryngeal nerves as low down as possible in the neck (being very careful not to cut any branches, or injure them by the forceps, etc.), and slipped a small piece of pure india-rubber cloth under each, as an insulator. The body was then placed in a chair, and the attempt made to observe the vocal chords in the ordinary way, but the mechanical disturbance caused by the rope, and the tenacious mucus which had gathered in the larynx, made this impossible, so that I was compelled to open the larynx between the thyroid cartilage and the hyoid bone by a very small opening, just large enough for the mirror, when an excellent view of the chords was had by Dr. Seiler. Repeated faradization, both with weak and with strong currents, and galvanization with from four cells up to forty, of the recurrent and also of the vagus, produced decided movements of the left chord only, and none of the right. I applied the two wires directly to each nerve, so that no other part should be involved, as might be the case if sponges were used. By these means I simulated the irritating action of a tumor as nearly as possible, and I found on later careful dissection that none of the fibres of the vagus were probably injured, and the cerebral circuit broken. The knot in the rope had been tied under the left ear, the head was thrown to the right, and thus the main injury to the soft parts was on the

right side. The right sterno-mastoid muscle was cut completely in two, its two ends being held together only by the connective tissue of its sheath. The left was only bruised. The vagus was not, so far as I could perceive, mechanically injured on either side. The superior laryngeal nerve was not mechanically injured, nor cut by opening the larynx. The hyoid bone was broken on both sides at the junction of the body and greater cornua. The vertebræ were neither broken nor dislocated, a condition I have verified in two other cases of judicial hanging.

The definite conclusion to be drawn from the experiment is that no chiasm of the inferior laryngeal nerves exists. No reflex motion was observed in the larynx, but the mechanical violence in such a mode of death is so great, and yet its effects may so easily escape observation, that, I think, as yet, no rigorous conclusion can be stated until other similar experiments are made, in which this source of error is absent.

At 12.10 P. M., having finished with the larynx, I proceeded to experiment on the muscles of respiration, a subject I had long desired to investigate. I first dissected the left phrenic, and insulated it with rubber, as before. I tried both wires to the nerve, but neither with the eye nor with a tape measure encircling the chest at the ensiform cartilage (marking 29¾ inches), was the slightest movement observed. I tried then a wire to the nerve, and with a sponge followed the border of the diaphragm, and then with both sponges to the diaphragm; but in no instance did I obtain the least response, either with the constant or the interrupted current. No reason could

be assigned for this failure to respond. Further dissection of the nerve showed everything normal and apparently uninjured.

I then proceeded to the intercostals. Probably no other muscles have been so variously interpreted as to their action, whether the inferences were drawn from theory as to how they must act mechanically, from direct dissection on the human body, from vivisections on the lower animals, from experiments on the dead body, or from faradization on the living. The most noteworthy modern observations are by Hutchinson (*Todd's Cyc. Anat. and Phys.* "Thorax"); Bean and Maissiat (*Archiv. Gén.*, 1842); Sibson (*Philos. Trans.*, 1846); Traube (*Beitrag. zur Exp. Path. u. Phys.*, 1846); Donders (*Handb. tot der Natuurk. van der Gezond. Mensch.*, Utrecht, 1853); Ludwig (*Lehrb. der Physiol.*, ii. 308); Budge (*Die Wirkung der Intercost. Muskeln*), and Duchenne (*Physiol. des Mouvements*, 1867, p. 641). The variety of opinion is seen in quoting these and other authors, as follows:—

1st. Both the intercostals are inspirators. Borelli, Sénac, Boerhaave, Winslow, Haller, Cuvier, Budge, Duchenne.

2d. Both are expirators. Vesalius, Diemerbroeck, Sabatier, Beau and Maissiat, Longet (though he is in doubt).

3d. The externals are expirators and the internals inspirators. Bartholin.

4th. The externals are inspirators and the internals are expirators. Spigelius, Vesling, Hamberger, Mareacci, Hutchinson, Donders, Ludwig, Flint,

Huxley, Marshall, Sibson (the last four especially, however, with modifications).

5th. The internals and externals are both expirators and inspirators. Mayer, Magendie, Bouvier, Burdach, Cruveilhier.

6th. They act together, but in one part of the chest are both inspirators, and in another both expirators. Behrens.

7th. They are neither expirators nor inspirators, but simply mechanically form a part of the chest-wall. Van Helmont, Arantius, Neucranzius.

No one, however, that I can discover, has before faradized the dissected muscles directly on the recently dead body, as in this instance.

At 12.26 P. M. I dissected off all the other muscles, and exposed the intercostals from the median line to the line of the axilla, and applied the interrupted current by two very small wet sponges, from the first intercostal space to the eighth. I first applied them to the intercartilaginous portion of the internal intercostals, and found that they all raised the cartilage below them. The external intercostals were then faradized, when the upper rib was pulled down very markedly, while the lower was just perceptibly raised. The depression of the first rib was very slight, but, as each external intercostal was examined in turn, the movement increased from the first to the seventh (the last four were not examined), while the elevation of the rib below varied but little. By means of hooks the fifth rib was fixed, and afterward the sixth rib, and the fifth external muscle faradized, with the same result as before. In order not to confuse the action of the external with that of the

underlying internal intercostal, nor the action of the intercartilaginous portion of the internal with the remainder of the internal, the external intercostals in the fourth, fifth, and sixth spaces were now carefully dissected away, and the internal muscles faradized from the cartilages to the axillary line, and in each case with very slight depression of the upper rib and marked elevation of the lower rib. Hence the conclusion was irresistible that the internal intercostals are inspirators, and the external expirators. I am aware of the imperfections of the observations. Nearly two hours had elapsed since death had occurred; the posterior half of the muscles was not examined, only three of the internals were examined where covered by the externals, no rigorous measurements were taken of the range of movement, etc.; but so far as they go they seem to warrant the conclusion already stated, and to point out the road to the proper method of determining decisively the action of these muscles.

Having but little time for further observation, I examined carefully but one muscle of the face. All had as yet perfectly retained their electro-muscular contractility. I placed one pole on the seventh nerve, and passed the other small sponge in the median line of the face, from the hair to the tip of the nose. I then placed one sponge on the middle of the nose, and passed the other up and down the middle line. At no point did I get any upward movement of the frontal muscle in its middle portion, but from just between the eyebrows down to the middle of the nose, the pyramidalis nasi always pulled the skin down. Subsequent dissection showed a well-developed

pyramidalis and no interruption in the fibres of the occipito-frontal on the forehead, in the median line. I am disposed, therefore, with Mr. Darwin (*Expression in Man and Animals*, p. 190), to regard the pyramidalis nasi as the direct antagonist of the central portion of the occipito-frontal, and *vice versâ*.

I would also take occasion to point out what important results this new method of investigation—*the faradization of the muscles on the recently dead*—promises to yield. In the living it is almost impossible to obtain the action of one muscle alone, especially in the face, where the emotions, pain, amusement, etc., involuntarily arouse the action of other muscles. In the recently dead the results will be far more accurate, and therefore for the anatomist, the artist, and the physiologist, they are of the greatest interest and importance.

ON THE

USE OF NITRITE OF AMYL

IN

VARIOUS FORMS OF SPASM, AND ON ITS VALUE AS AN AID TO DIAGNOSIS.

By

S. WEIR MITCHELL, M.D.,

MEMBER OF THE NATIONAL ACADEMY OF SCIENCES.

[Read February 3, 1875.]

The history of the employment of nitrite of amyl in epilepsy and in other forms of spasm is brief, and necessitates the mention of but few persons. Excepting its use in angina pectoris and in asthma this powerful agent had been little resorted to, when, in April, 1872 (see *Philada. Med. Times*), I reported cases of its use to arrest epileptic attacks. During the same year I advised Dr. Jenks to test its value in puerperal eclampsia, which he accordingly did do, reporting his success in the same journal in 1873. During that year (*Arch. Sci. and Pract. Med.*, No. 4, p. 311, C. E. Brown-Séquard and E. E. Séguin, New York), Dr. Wharton Sinkler, then my assistant at the Infirmary for Diseases of the Nervous System, related a remarkable case in which nitrite of amyl had been freely used with admirable results. Since then, in the *Medical Times* and in the *Reporter*, July 25, 1874, I have more briefly alluded to the value of this agent as a means of diagnosis.

I make this statement as an introduction to what I shall have to say of the nitrite for two reasons, first, because it shows that what I shall state is founded on no brief or recent experience, and second, because it seems to be unknown in England that it had been long used as an antispasmodic agent in America. I infer this from the fact that Dr. Crichton Browne (*West Riding Lunatic Asylum Medical Reports*, 1873), in a very able essay on nitrite of amyl in epilepsy, while recognizing its value, does not allude to its previous successful employment in this country.

In this present paper I propose to bring together all that I have done or suggested as regards the use of this powerful agent.

For more than a year I had been aware that nitrite of amyl would be a proper means to use in epilepsy. It was clear to me that the nitrite caused, with rapidity, fulness of the vessels of the whole head, and that near to the outset of an attack of epilepsy there is a condition of vasal spasm. I hoped that I would be able by the use of the nitrite to counteract this state of vascular contraction, and so to break the chain of morbid phenomena, and thus end the attack before its more disastrous consequences should follow. This reasonable expectation was not disappointed. I was, of course, well aware that in most cases of epilepsy there would be no time to secure the inhalation of enough nitrite of amyl to produce an effect, but I was also aware that in at least two classes of epileptics the opportunity for its use would be given. There are rare examples of epilepsy in which the warning of the coming on of an attack so far precedes

the spasm and loss of consciousness as to enable the patient to inhale the nitrite. In other cases the patient has a succession of fits within a limited space of time, and being then, of necessity, in bed, is so placed that a watchful nurse may find time to use the nitrite. I waited long for my first chance, but in March, 1872, the opportunity came. I give this case at length as I first reported it in the *Philada. Med. Times*, April, 1872.

J. C., æt. 23, was excessively prone to self-abuse until, at the age of eighteen, he began to indulge to an extravagant extent in venery. At twenty he had a chancre, but thus far no secondary results. On the 4th of March, 1871, he became slightly intoxicated, went to a neighboring city, and for some days gave himself up to sexual excitements to such an extent, as he described it to me, as to show that either he had unusual virile power or that he exaggerated his prowess. Be this as it may, there is no doubt that he ran into great excess, and that the punishment was distinctly born of the offence. On March 9th he felt feeble, but nevertheless had connection four times that night. On the 10th he had, twice, twitching of the left forefinger. On the 11th this grew worse, and on the 12th, after unusual sexual excesses, he had a prolonged spasm of the left arm. It began in the hand, and in a few minutes involved all the fingers in forced flexion. Then the wrist bent, and the flexed forearm was forcibly contracted. The attack, which surprised the patient but did not alarm him, ended with slight vertigo. A week went by without further trouble, when a series of complete epileptic fits began, always preceded by the local convulsions which I have described. The fits, which at first came on daily, soon lessened in number, and of late have recurred but once a week. On two occasions they have been sudden and without warning, but in all other cases the hand has been affected with spasm, followed in a few minutes by vertigo, twisting of the head to the left side, left unilateral convulsion, and finally bilateral

spasms, with occasional tongue or cheek-biting. The attack is followed by prolonged stupor.

Many remedies have been vainly employed, and even the bromides in full doses failed to do more than lessen the number of attacks; while strychnia, valerianate of quinia, zinc, and other agents have all alike failed to afford relief.

I made many experiments with a view to cutting short the fit by interfering with the precedent local spasm; but neither blisters along the nerve-tracks, which are not tender, nor a ligature tightly applied, proved of any use. I then gave the patient a drachm of chloroform in a phial, directing him how to inhale it from a handkerchief, but soon found that he was unable to inhale enough of it to serve his purpose. As a last resort, I gave him in a very small phial three or four drops of nitrite of amyl, and showed him how to inhale it by putting the open phial up one nostril while with one finger he closed the other and then made a few full inspirations. The first attempt failed, because, as he said, the spasm of the left limb made him nervous. On the second occasion he began to breathe it the instant the fingers twitched, having pulled the cork of the phial with his teeth. In a few moments he felt his face flush, the carotids beat violently, his head felt full, and, the spasm ceasing, the attack at once, and for the first time in his experience, was cut short. Four days later he thus cut short another attack; and the experiment has since succeeded in eleven fits, and failed, from too late use of the nitrite, in two. Moreover, the attacks have lessened in frequency, and now come on only once in ten to twenty days. Not only is there no evil effect from the drug, but his memory has improved. He is again taking bromide of lithium.

The case above quoted has since then continued to improve. During the last two years and a half he has had only seven fits, the last being nine months ago. I said seven fits, but in reality only one fit, all of the others having been cut short by the nitrite.

A year ago he ceased to employ any bromide, and has been since then using only phosphorized cod-liver oil with strychnia.

Since this case demonstrated for me the remarkable power of this agent to check spasm, I have given it for that purpose a number of times, its value being limited by the rarity of cases in which there is time to secure its full inhalation. In some of my examples the chance of using it has been occasional only, not all of the attacks affording the time needed to secure its value.

J. C., æt. 32, was a good case of this. He had fits about once a week. The persistent use of thirty-grain doses of bromides kept the case in control; but two or three days' omission of this agent was sure to bring about a return of the attacks. His fits came on with a violent spasm of the thumb of the right hand. In most instances they became general too rapidly to admit of interference, but perhaps once in three or four times there was at least a minute of painful spasm of the right member before the loss of consciousness. On four occasions this man was able to use the nitrite, and in each case the fit was aborted.

In both of these cases the warning was in the form of a commencing unilateral spasm. In the following case there was a gastric aura which preceded the fit by an interval so long as to enable the sufferer to inhale the nitrite.

Miss E., æt. 26. Has had epilepsy seven years. Her whole history it is needless to relate. About one minute before the fit comes on Miss E. has a sense of what she calls "goneness" at the epigastrium. This sensation passes into nausea, and apparently the fit interferes with the consequent vomiting which very rarely follows.

This form of aura is certainly rare. In a single case during the war I saw an epilepsy in which emesis, lasting half an hour, preceded the fit. It was cured by full doses of emetics given promptly at the moment nausea was felt. In Miss E.'s case the fits have gradually lessened in number and severity under the use of full doses of nitrate of silver. The nitrite of amyl instantly arrests both the nausea and the sequent fit; but the sense of fulness in the head so alarms Miss E., who is a highly nervous and emotional person, that she is very averse to using it.

The following case, which, apart from the use of amyl nitrite, is one of the most remarkable known to me, was reported by my former clinical assistant, Dr. Wharton Sinkler, in the New York *Archives of Medicine*, but as these were seen by but few, and had a brief existence, I make no further apology for quoting enough of it to show how valuable the nitrite of amyl may be during the epileptic state:—

James M., æt. 24, single. Nov. 1871 fell ninety-five feet, and had fractured ribs, dislocated ankle, and fracture of the lower dorsal spine. Unconscious one week. Subsequent palsy of legs, and insensibility. He was five months in this state, and had all of this time incessant headache; then he began to have convulsions, and lost hearing and speech.

When he entered the Infirmary for Nervous Diseases, he walked on crutches, but the left leg was palsied totally and much contracted. The tongue and velum were paralyzed, and he was deaf and speechless.

On the 14th day after entering he had a fit, and they became almost incessant. Blood was taken from his neck, and almost at once hearing came back, but the fits, which were violent, continued.

Nitrite of amyl was now used. It checked a long fit in-

stantly, and after this it was given whenever a fit took place, and it could be used in time. In every instance it aborted the fit.

It is needless to say more, save that he became, under various treatment, a strong and really quite vigorous man, able to do a hard day's work.

With this case I close my evidence as to nitrite of amyl in epilepsy. I have never seen it fail where there was time to use it. Last week I suddenly checked with it a fit coming on in my own office, and a few months ago had the chance of exhibiting to those present at my clinic its capacity to stop for hours the convulsions of tubercular meningitis in a child.

From what I have seen of this agent it does not seem to possess, in most cases, any capacity to lessen the probability of a return of the fits; but of its power to arrest the actual convulsion there can be no doubt. As I have already mentioned, I asked Dr. Wm. Jenks to test the nitrite in puerperal convulsions. His evidence as to this point still awaits confirmation by other observers.

I have spoken of the use of the nitrite in the convulsions of tubercular meningitis. I have not yet used it in forms of spasm from peripheral irritation in children, but it would be, I should think, a safe and a ready agent. Neither has it been as yet employed in the horrible convulsions of uræmia.

Before passing from this subject I am tempted at the risk of some detail to speak of a case which is remarkable for the fact that the patient is liable to several, at least three, forms of attack, and that the nitrite, while it checks one of these, does not seem to

affect the second form, and, as to the third, far from relieving, only makes it worse. This case has never been published, and I do not hesitate to give it in full, since it is of extreme interest, and distinctly illustrates the possibility of a patient being subject at one time to attacks involving anæmic states, and at another to those which are attended with opposite conditions.

The patient is a cultivated and energetic clergyman, æt. 35, a resident of a neighboring city. He is free from obvious physical disease, and despite his disorder, is capable of doing, and does do an abundance of work, involving sometimes severe taxation of mind and body. There is some doubtful evidence as to a sunstroke in his later boyhood, but his first attacks of *petit mal* seem to have come on during the war while in service with the militia—known as the six months' men. At this time he was physically overtaxed, and was greatly exposed to the summer sun, and slept at night without shelter. I shall leave his graphic statement of his case to tell its own very interesting story.

May 21, 1873.

Dr. S. Weir Mitchell.

My Dear Sir: I have been troubled for some time past with certain seemingly nervous attacks, the precise character of which, however, I fear it may be very difficult for me to explain, inasmuch as it must always be necessarily hard accurately to describe our feelings in words. But that I may be able the more clearly to set before you the symptoms accompanying them, I have taken the liberty, simply for my own convenience, of dividing them into several classes, each of which seems to me to have its own peculiar characteristics.

1st. Those which have come to be most serious with me, I have learned to denominate as Attacks of Forgetfulness. My first feeling when one is coming on is of severe oppression across the chest, which sometimes makes it very difficult for me to breathe, and always causes me at once to try to get into the fresh air. This I seldom accomplish, however, as the oppression is almost instantly succeeded by a nervous feeling which creeps over my whole body, and seems to change all the conditions of my existence. I unconsciously move my mouth as if chewing, and sometimes will also grit my teeth. The things around me seem to be moving, and, if I am reading, the book will appear to be going from me, when at once I feel as if all must be a dream, though well knowing at the same time that it must be reality. Then everything seems to leave my memory, and I keep continually striving to connect my thought with some event in the past, which seems to be hanging over me, but which I cannot yet recall. Indeed my whole state of mind at such a time may be best compared to the feelings of one suddenly awakened out of a sound sleep. He cannot catch hold of the dream which seems to be quickly passing from him, and at the same time he cannot yet appreciate the state of consciousness into which he has so suddenly awakened. And thus unable to realize his surroundings, and equally unable to grasp the quickly fading past, he remains in that disagreeable intermediate state, so to speak, which each one of us has at times experienced.

Now just so it is with me in these attacks. There is always something going from me which it is impossible for me to recall, and at the same time an inability to realize the actuality of my surroundings, while, through it all, the fear of some impending catastrophe seems to be hanging over me. This fear seldom goes with the attack, and sometimes, if the attack has been a severe one, will haunt me for three or four days afterwards.

During these attacks I can walk, talk, or use my hands, though everything I take hold of has a strange feeling to my touch. They last generally from two to four minutes,

when a considerable belching of wind takes place, and immediately things begin to assume an appearance of certainty about me. But then a violent perspiration pours forth from my forehead, and a feeling of extreme prostration and weakness in the knees comes over me. The past which has gone from me, however, only returns to me by degrees, and some things which have thus faded from my memory never return. For example, books which I have read previously, and even marked and made notes upon, may be taken up by me afterwards as entirely new books. Sermons which I have written with considerable care, may be read by me as productions which I had never seen before, and different cities or places may be visited as entirely new sights; while, on the other hand, there are things which I will continue to remember with even more than ordinary distinctness; and books that I have read, and sights that I have seen years ago, seem to have an equally strong hold upon my memory.

I can give no rule for that which I forget, and that which I remember. The first of these attacks which ever came to me, occurred in the summer of 1863. I had gone out with the militia at the time of the Gettysburg Raid, and such was the extent of the forgetfulness caused, that at the time I could not recall where I was and how I came to be there, and many of the incidents and places of the campaign, fresh in the minds of my companions, have ever continued to be an utter blank in my memory. I may add that we were without tent shelter, and that I was thus exposed both day and night.

2d. The second class of attacks I would denominate as Paralyzing. They come on very much as the others, but more suddenly, and the feeling of oppression, in the first, is rather one of hollowness in these; then at once my right hand becomes fixed across my breast, and I lose all control over my words. My mouth moves even more than in the other attacks; and while I can enunciate yet I am unable to converse, as I cannot recall even the most familiar words or forms of expression that I may endeavor to. The same feel-

ings of uncertainty usually surround me as in the others, though by no means as severe. But no perspiration or such extreme weakness follows, and the general after-effects, though of the same nature, do not begin to compare in their severity with those of the former. The signal for the discontinuance of these attacks is likewise a belching of wind, and indeed this is the case with all of them whatever be their nature. This class of attacks does not date back over a year.

3d. Both these classes of spells may occur at night, and, unless I am awakened by some one, I will generally sleep through them. But I would immediately awaken any one who was near me, by the peculiar smacking of the mouth and gritting of the teeth to which I have alluded. This does not date back over six months.

4th. Flush attacks also come upon me rarely. They commence as though I were going to have a severe attack of forgetfulness, but seem to be turned off sometimes by the power of my will, and sometimes by the mere belching of wind, while others culminate only in a severe perspiration.

5th. Ordinary attacks of dizziness are common to me, though without any of the feelings or effects which accompany any of the former attacks. Yet they are sometimes so severe, that in my walks I must sit down, or go up to a store window where I can stand still, have something to hold on to, and shut my eyes. These are generally controlled by an effort of the will if taken in time.

6th. Scarcely a day passes that I do not have at least one spell of double sight, and in analyzing such double sight, I have found that the false image is made by the right eye, and seems to fall from one to six inches above the object. I always have spots in front of the right eye, and which sometimes seem to form themselves into an image of the eye about one foot in front of it. These three classes of attack (4, 5, 6,) date back from twelve to fifteen years.

7th. I have considerable and severe pain through my right eye. It generally begins in the early morning with a severe headache, which by 10 o'clock has entirely settled in the eye.

I have been troubled with this eye-aehe for fifteen years, and it was wont to come regularly every week on Sunday, though lately it has been far less frequent, and very irregular in its return. It has not seemed to have any connection with my other attacks until recently, but now when an attack comes on while I am suffering from pain in the head or the eye, the pain, be it ever so severe, will leave me during the continuance of the attack.

Apart from these troubles, I enjoy very good health, though I always have an excess of wind in the stomach and bowels, and am continuously afflicted with a severe eatarrh in the head, and considerable thick phlegm. The raising of wind, as I have said, often prevents the culmination of an attack. I have no headache with the exception of that spoken of, which is a beating one, never lasting beyond 10 or 11 o'cloek in the morning.

Despite the existenee of stomaehal symptoms, no amount of attention to the stomach, and no form of diet seems to make much difference in his attacks. I have all along regarded his case as allied to epilepsy, and was glad to find that Dr. Hughlings Jackson, who has seen him, shared this opinion. In its favor is the fact that the bromides are capable of giving him great immunity from the fits, but when used in the full doses required, they rapidly enfeeble him, and very soon weaken his memory, so that they have to be used with the greatest caution, and guarded by the constant employment of arsenie. The eye ground presents no peculiarities. He speaks of several forms of head trouble. In the spasmodic attack the right thumb is first turned inwards, then the fingers, and lastly the wrist, are foreibly flexed. Rarely the neck is twisted, and more rarely the right face. This form of fit is cut short by the nitrite. As the face flushes the attack passes off. The spells of pure giddiness have been frequent of late. They come on suddenly, and there are none of the strange mental conditions which attend the other spells. Now in these vertiginous fits the nitrite if used early only

hastens the culmination of the trouble and, he believes, greatly intensifies it.

I have made frequent use of nitrite of amyl in a variety of forms of disease, chiefly spasmodic, some of them hysterical, and some of indeterminate birth and relationship.

Its influence over cases of hysterical angina is as well marked as in those of men, or in non-hysterical attacks of this disorder. I have twice employed it in forms of disease which are akin to angina, are not infrequent, but lack a distinct name.

Here is one which may pass as an illustration.

A middle-aged lady, after many and grave trials during the late war, began to suffer from occasional attacks which came at any time in the day, held no relation to conditions of stomach or uterus, but were at last most frequent and distressing. A sense of fulness at the epigastrium announced the attack, and from the stomach a sort of aura, accompanied with a feeling of panic and terror, passed up into the head, with intense pain in the right neck and face, the infra- and supra-orbital region, and at last a few moments of deadly pallor ended the attack, which occasionally wound up with nausea and rarely with emesis. There was no irregularity of the heart, no pain in the arm, only a slight quickening and enfeeblement of pulse towards the close of the attacks, which usually lasted from one to five hours, and when I saw her were of daily occurrence. After trial of many means I at last used the nitrite of amyl. The effect was singularly happy, and it was very rare that it failed to break up and dispel the trouble. After a time I gave her a small vial of the nitrite, and this she continued to use, her attacks growing less frequent and less severe. When I heard last from her they were still under control of the nitrite.

I come now to speak, and with rather more

hesitation, of the use of this agent as an aid to the diagnosis of certain forms of cerebral disorders.

Those who see much of neural diseases meet very often with cases of head troubles in which there are attacks of vertigo, or disturbed equilibrium, or mere sense of fulness, with or without mental disorder. Occasionally these troubles are plainly not epileptic. Sometimes they are either epileptic and distinctly so, or else are the far away beginnings of that malady. Sometimes a therapeutic diagnosis is possible, and the mere fact of the bromides controlling them may, when taken with the symptoms, clearly settle their nature. But very often our suspicions are in favor of their being purely vascular disturbances of congestive type, and then I think that the nitrite of amyl may prove serviceable in settling the question; since in such cases the inhalation will sometimes recreate briefly the train of symptoms, so that they are at once recognized by the patient. This when it occurs is fairly conclusive as to the attacks having been truly congestive in character. The negative has also its value. Personally, I have obtained useful help from this means, but I look upon the whole matter as one which it is well to present to the profession as worthy of study, without at present claiming for it any very great utility.

I give below cases to illustrate the use of the nitrite in diagnosis:—

E. L., accountant, a very nervous and irritable person, æt. 29. Has spells, two or three times a week, in which he is said to lose consciousness without any coexistent spasm. On other occasions the trouble does not go so far as this. Has been told the attacks are epileptic. On inhaling nitrite of amyl,

he said at once, "that is the kind of feeling I have in my attacks." Then he asked to have the inhalation repeated, and again recognized the symptoms as like those he had had. I came soon, thus aided, to understand, with no doubt in my mind, that his fits were coincident with relaxation of the arterioles. He was rapidly cured by full doses of digitalis with general tonics and cold shower bath.

I. C., æt. 40, lawyer. This gentleman has vertigo, in which external objects float around him, from right to left. He does not know if he flushes in the attacks. I can find no reason for them in the state of any extra-cranial organ; nitrite of amyl causes in him the usual symptoms, but no trace of vertigo. This is a fair type of many cases in which I have used nitrite of amyl. It never reproduces the vertigo.

Robert H., æt. 38; a master of an oyster boat; had a slight sunstroke in August, 1873. Ever since he has a great deal of vertex headache, with now and then severe attacks of general headache. I was inclined to believe that the vertex pain was due to a subacute meningitis. It was suddenly made worse by nitrite of amyl, to which he was very sensitive. I have said that it was made worse; it was in fact increased by this drug to such a degree for a few minutes as made me regret my experiment.

I might multiply these examples. In some cases the nitrite has failed to help me, in others it has returned a useful negative, in others a still more valuable affirmative. I shall add but a single case.

Mr. Ph. C., æt. 43; had, ten years ago, a malarial fever, followed by a sharp attack of cerebral peripheral meningitis. From these diseases he recovered, but has had ever since, at brief and briefer intervals of late, left frontal headaches. Within six months these are accompanied with certain very curious disturbances of speech, which last for but a few hours during the height of the headache. At these times he pronounces certain words as if the first letter or first syllable had no existence. Thus—a very bad dog would become an

ery ad og. Sometimes he adds the first syllable of one word to the next, and its first to that of the preceding word. Thus—a bad dog would become a *gad bog*, and so on. In these attacks the left temporal artery throbs visibly and most remarkably, but the face does not flush. The attacks occur always after dark, but when I gave him nitrite of amyl in my office, I suddenly reproduced the headache, and the train of peculiar lingual phenomena. He said top for *stop*. *Hat turts*, that hurts. *Thy med robs*, my head throbs. The effect passed off suddenly, and his usual control of language returned.

As to this case there could, I think, be little doubt that the cause lay in an over-readiness of the vessels of the left anterior cerebral lobes and subjacent meninges to fill up with blood, and so for a time to disturb the nutrition and function of the parts concerned.

I find physicians very timid as to this remedy, but after much and long use of it, I have altogether lost the dread of it with which I began. I would suggest that in syncope and in hysterical convulsions it might well repay a trial, and that possibly in the cerebral symptoms arising from shock it may also prove of value, and should be essayed in the cold stage of ague.

CASE

OF

ACUTE TETANUS,

SUCCESSFULLY TREATED BY THE INHALATION OF THE NITRITE OF AMYL, WITH REMARKS UPON THE PATHOLOGY OF THE AFFECTION.

By

WILLIAM S. FORBES, M.D.,

SENIOR SURGEON TO THE EPISCOPAL HOSPITAL.

[Read April 7, 1875.]

Tetanus has usually been defined by writers as a disease characterized by "a violent and painful contraction of the voluntary muscles, which is long continued and uncontrollable."

It is my purpose, in this paper, to lay before the Fellows of the College the history of a case of violent acute tetanus, beginning on the fourth day after the reception of the wound (an extensive burn), and advancing with great rapidity—having, in 40 hours from its commencement, a temperature of 102°, a pulse of 133, and a respiration of 32 per minute—presenting marked opisthotonos, with trismus and a horrid tetanic grin; and having the muscles of deglutition considerably involved, together with paroxysms of brief and painful spasms which yet were perfectly controlled by inhalations of nitrite of amyl, which were given in doses of five drops twice a day for

forty-six days, and which restored my patient to perfect health without the administration of any other agent beyond good nourishment. My patient is here now before the College. I shall give the history and treatment of the case first, and then I shall make such statements concerning the pathology and future treatment of tetanus as I think may be warranted from existing facts, and derived from a survey of the field of literature on the subject.

[The patient was then presented.]

S. H., aged seventeen, a brickmaker, was admitted to the male surgical ward of the Episcopal Hospital on the afternoon of the 5th February, with burns of his body and extremities from hot iron. He stated that a short time previously some hot iron had been thrown on some moist earth in a foundry where he was, and that suddenly the iron was blown against his person and burnt him; that he immediately jumped into a trough of cold water which was standing near, and had then walked with help up to the hospital, a mile and a-half distant, the air at the time being very cold, the thermometer being that afternoon at 18° F. On removing his clothing, a great part of which had been burnt and blown off, he was found to be burnt from his waist down to his heels, the buttocks more severely than the legs; the sphincter ani was also involved; there was also a considerable burn on the forehead and shoulders. The burn was of the second and third order of Dupuytren, and in several spots extending to the fourth order, as described by that surgeon; that is, the entire thickness of the true skin was involved.

From this extensive wound, from his cold bath, and from his exposure to the very cold air in walking with assistance for a mile and a half, we could reasonably imagine that tetanus would probably follow very soon, nor were we disappointed.

The patient was put to bed, his wounds dressed with lin-

seed oil and lime-water, his whole person enveloped with cotton, and half a grain of sulphate of morphia administered. Five hours after, being very restless, half a grain of morphia was given; he then passed a quiet night and got some sleep. On the following evening, February 6, he had a severe chill, lasting twenty minutes, and he complained of great pain in his extremities and along the spine; he was given half a grain of morphia, which was afterwards repeated once; the linseed oil dressing was removed, and the wounds were dressed with the *Ceratum Resinæ Acidum*[1] of Mr. Lund, of Manchester, which I found in this case as in others a most excellent application.

On the 7th, the patient felt quite comfortable; he took some food and had one-fourth of a grain of morphia in the evening. On the 8th, he felt comfortable; he was given a little Rochelle salt, and in the evening a little morphia; the last that he received. On the 9th, he had no desire for food; he complained of soreness, and as if some one had beaten him; he was ordered five ounces of brandy and eighteen ounces of milk for the day; he had a severe convulsion in the evening. On the morning of the 10th, he had stiffness of the jaws, with

[1] The following is Mr. Lund's formula:—

Ceratum Resinæ Acidum.

℞.—Resinæ flavæ, ℥iv (in winter ℥x).
Ceræ flavæ,
Olei olivæ, āā ℥xx (in winter ℥xxx).
Terebinth. Chiæ. ℥viij.
Picis Burgund. ℥iv.
Zinci oxidi, ℥iv.
Solut. acidi carbolici, f℥iss.
Misce, fiat unguentum.

To be applied to burnt surfaces spread on lint.

The *Solutio Acidi Carbolici* is thus made:—

℞.—Acidi carbolici puri (Calvert's crystals, melted), f℥xvj.
Glycerinæ puræ, f℥viij.
Aquæ destillatæ, f℥viij.
Misce, fiat solutio.

pain in the back of his neck, and his mouth began to assume a tetanic grin; he was given milk and beef-tea, and five ounces of brandy during the twenty-four hours. On the morning of 11th, there was marked opisthotonos with trismus, accompanied with great difficulty of swallowing, which began the evening before; his skin was hot, temperature 102° F.; his pulse 133, and his breathing 32 per minute; a teacupful of beef-tea was ordered every two hours, alternately with milk, to be taken day and night, and eight ounces of brandy in the twenty-four hours. He had a convulsion during the night.

In view of the excellent effects of the nitrite of amyl in the treatment of angina pectoris, as recorded by Brunton, in a paper published in the *Lancet*, vol. ii., 1867, p. 97, and in another paper, by Wilks, published in the same journal for January 16, 1869, and again in the paper of Dr. Mitchell, on the treatment of epilepsy by the inhalation of nitrite of amyl, published in the *Medical Times* of this city in April, 1872, I determined to try the virtues of the same drug on the contraction of the muscles in this case of tetanus, and to try it alone, and without the intervention or administration of any other medicinal agent whatsoever, that its efficacy might be properly tested and that it should stand or fall as the issue of the event, in this case at least, might determine. And I now have the liveliest satisfaction in announcing the happiest result.

At that moment I was not aware that the nitrite of amyl had ever been administered in any case of tetanus, but, on examining accurately the medical journals, both foreign and domestic, since 1864, when Dr. Richardson first announced to the British Association for the Advancement of Science his brilliant

experiments in regard to the action of nitrite of amyl in the blood and circulation, the muscular tissue, and the nervous system, I find that this drug has been used in three cases of tetanus, and in only three cases; and that each case terminated successfully, but that on each of these three occasions, taking place in 1870, 1871, and 1874, the amyl was used with other and well-known agents in the treatment of tetanus, largely administered, so that the record of the action of the amyl has been manifestly much obscured; the opium, hydrate of chloral, tonics, and aperients given in these cases, have clouded what perhaps otherwise would have been the visible action of the amyl in the successful issue in each instance. The case I now record is the fourth case of tetanus in which the nitrite of amyl has been used, but, so far as my knowledge extends, it is the first case of acute tetanus in which the amyl has been used alone and successfully, and its action recorded.

The first two cases, in 1870 and 1871, were in the care of Mr. Foster, of Huntingdon. In the case of 1870, published in a short letter to the *Lancet*, vol. i. 1870, the tetanus supervened on the eleventh day after the accident. Five drops of the amyl were directed to be inhaled on the thirteenth day, and directed to be given by the man's wife on each return of the spasm; it was so used for nine days, Mr. Foster states, and an ounce was consumed when the man appeared to be well. Mr. F. adds that he gave a thorough supply of nutrients, with a few stimulants, tonics, and aperients.

The second case was likewise under the care of Mr. Foster, and is reported by Mr. Wilson, in the *Lancet* for 1871. Tetanus supervened three weeks after the injury. Five drops of the nitrite were inhaled on the return of each spasm, until three drachms were used in fourteen days.

Hydrate of chloral was likewise given for the same length of time, when the man appeared to be well; after forty-eight days he was discharged cured.

The third case is reported in the *New York Medical Journal* for 1874, as occurring in the practice of Dr. N. F. Curtis, in the Charity Hospital. Five drops of the amyl by inhalation were given on one single occasion, in a spasm which was relieved by the application. Ten drops of Magendie's solution of morphia and a hot air bath were afterwards given and the patient was relieved.

To continue the record of my case—

The nitrite of amyl was ordered on the 11th of February, at first in doses of three drops to be administered by inhalation twice daily, and a record to be accurately kept of the temperature and the pulse, morning and evening. Dr. Rudderow, our resident physician, to whom I am indebted for these notes, kept the record and administered the nitrite. Dr. R. first administered the amyl on the evening of the sixth day after the accident, and about forty hours after tetanus first discovered itself; before the three drops had entirely evaporated the heart's action became more quiet, and at each inhalation of the amyl afterwards it was generally observed to have a quieting effect on the heart's action; towards the latter part of the treatment the pulse was among the eighties, although on giving the patient five drops on the 4th of April, six days after he had ceased to inhale five drops twice daily, the heart's action was 132 and tumultuous; whether this was because the system towards the last was becoming accustomed to the action of the drug or not I cannot say, but this same action of the heart in angina pectoris is recorded by Brunton and by Wilks in the papers already alluded to. In the present case, after the cure of the tetanus, the amyl excited the heart as in health.

To resume: The eyes were suffused; the skin of the face and neck became very much congested; indeed the whole

surface of the body was more or less congested, but this soon passed away when the amyl was withdrawn. The three drops had scarcely begun to cause congestion when there was evinced a tendency to gape, and a few days afterwards gaping and yawning both took place at each inhalation until the administration of the drug was discontinued; this gaping and yawning was produced also on Dr. Rudderow while administering the drug on each occasion. The man said, some hours after the inhalations, on several occasions, that his head felt as if "something was running around in it," to use his own expression. On the evening of the 12th, he felt more comfortable and had had some sleep.

On the 13th, he felt more comfortable; he was more cheerful; his appetite was a little better; his bowels were regular; his opisthotonos became a little less after each inhalation.

On the 14th, he was not so well, he had another spasm, the third; the nitrite was now ordered to be given in doses of five drops twice a day.

On the 15th, he is better, more cheerful; takes his nourishment, but says before evening he wants his medicine (meaning his amyl); that it always makes him feel better immediately after he inhales it. On the 16th, he is still improving; the sardonic grin is manifestly less, and his opisthotonos is much less. On the 17th, he is still improving.

On the morning of the 18th, the eighth day of the attack, the amyl in the hospital gave out, and it was only on the evening of the 20th that it was replaced. For sixty hours my patient had no nitrite of amyl; his pulse rose late that night to 116, from having been 100 the evening before; his temperature rose to 100°, from having been 98° the evening before. On the morning of the 20th, forty-eight hours after he had taken this last dose of the amyl, the opisthotonos and the tetanic expression both were manifestly returning, and he appeared to be threatened with a spasm. The man told me he "longed" for the medicine which did him so much good when he breathed it. In the afternoon, when he again inhaled five drops after an interval of sixty hours,

he again came rapidly under its influence. He said he felt better almost immediately; his pulse and his temperature again abated; again the presence of his terrible enemy appeared to recede and his horrid grin to cease. This accident of the cessation of the administration of the amyl discovers a most important event in its use; it points to the efficacy of the drug in this case most notably. I determined to keep up its happy agency until I discovered that the morbific influence, whatever it might be, had entirely abated. It was given accordingly until every vestige of rigidity, soreness, and expression of the presence of tetanus had left my patient. I looked upon this line of treatment somewhat as I would upon the use of quinine in intermittent fever, to eliminate the morbific agent. I desired to control the muscular contractions until the morbific influence should be eliminated.

On the 29th of March, forty-six days after the first dose of the amyl was given, my patient appeared to be perfectly well. He could walk about, and eat, and drink, and enjoy himself in every way as before the attack, except having a feeling of weakness. I now directed a discontinuance of the amyl; he had inhaled one ounce.

The following table shows the state of the pulse and temperature as taken at 9 o'clock in the mornings and at 6 o'clock in the evenings, half an hour after the inhalation:—

	Morning.		Evening.	
	Pulse.	Temp.	Pulse.	Temp
February 11			133	102
" 12	132	100	136	99½
" 13	124	99	124	99½
" 14	120	99½	124	99½
" 15	124	99	116	99
" 16	124	99½	128	100
" 17	120	99½	100	98

	Morning.		Evening.	
	Pulse.	Temp.	Pulse.	Temp.
February 18	100	98	116	100[1]
" 19	100	100	116	100½
" 20	100	100½	100	100
" 21	112	100	100	100
" 22	100	99½	116	100
" 23	96	99½	100	98½
" 24	100	100	106	101
" 25	112	100	106	100
" 26	100	99½	106	100
" 27	100	100	96	100½
" 28	92	100	98	100
March 1	98	100½	100	99
" 2	100	100½	100	100½
" 3	100	99½	100	99½
" 4	112	99½	110	100
" 5	96	99½	100	100½
" 6	100	99½	112	100
" 7	104	100	100	98½
" 8	96	100	92	99½
" 9	96	99½	96	99½
" 10	100	99½	104	100½
" 11	100	99½	104	100
" 12	100	100	100	100
" 13	100	100	96	100
" 14	100	99	100	100
" 15	100	99	106	98½
" 16	100	99	100	98½
" 17	96	99	96	99
" 18	92	98½	84	98½
" 19	84	98½	88	99
" 20	84	98	96	98
" 21	88	98	84	98
" 22	80	98	84	99
" 23	80	98	84	98½
" 24	80	98	84	98
" 25	80	98	84	98
" 26	80	98	80	98
" 27	84	98	80	98
" 28	80	98	80	98
" 29	80	98	80	98

[1] On the evening of the 18th the nitrite of amyl was unavoidably suspended; for sixty hours he got none. On the evening of the 20th it was again administered.

The great diversity of circumstances under which patients have recovered from tetanus tends in a great measure to mislead the pathologist rather than to instruct him. It appears that he can be enlightened only by an extended examination of the body living and dead.

Macnamara, after a considerable experience with tetanus in India, states, that when the temperature exceeds 100° the patients die; that when it is under 100° they generally get well.

Verneuil asserted, before the Surgical Society of Paris,[1] that the increase of the general temperature in tetanus should not be ascribed to the general muscular spasm which had hitherto been considered as the sole cause of that phenomenon, but that it resulted solely from the excitation of the spinal cord.

In examining the spinal cord in six cases of tetanus Lockhart Clarke stated, before the Royal Medical and Chirurgical Society,[2] his ground for the following conclusions: That the lesions are either not present in the spinal cord, or are present to a very slight degree, in those cases which recover; that these lesions are not the effects of the great functional activity of the cord manifested in the violent spasms, but are the effects of a morbid state of the blood-vessels. That these lesions are not alone the cause of the tetanic spasms, but that the tetanic spasms depend on two separate causes, viz., first, on a morbidly excited condition of the gray substance of the cord induced by the hyperæmic and morbid state of its bloodvessels, propagated from the injured nerves

[1] L'Union Médicale, Mai 21, 1870. [2] Lancet, vol. ii., 1865.

and resulting in exudation and disintegration of tissue; and, secondly, on an irritation propagated and spread through the morbidly excited cord from the same source, viz., from the periphery by the diseased nerve.

Curling and Pelletier hold to the view that in every case of traumatic tetanus the disease is due to the inflammation extending from the injured nerves to the membranes and substance of the spinal cord.

Froriep has published seven cases of traumatic tetanus, in which there were swelling and redness of particular portions of the nerves between the wound and the spinal cord.

Dickinson, in the *Medico-Chirurgical Transactions*,[1] states the condition of the spinal cord from a case of traumatic tetanus, and remarks that there was a certain amount of disintegration of nervous elements.

Dr. Clifford Allbutt[2] reported the condition of the spinal cord in four cases of traumatic tetanus to the London Pathological Society. He stated that in the pia mater and in the central gray matter vascular changes were observed, and that the central canal of the cord was stuffed with epithelial matter in over-abundance. The cells in the anterior horns were singularly wasted in a very symmetrical manner, no doubt due in part to exudation about the vessels, but also to changes in the cells themselves. The cells were the subject of yellow disintegration, beginning in the centre of the cells and invading them from the centre to the periphery. Many were seen to run together, forming an irregular and more or less fatty mass,

[1] Vol. li., 1868. [2] Lancet, Feb. 25, 1871, p. 270.

these masses giving rise to the appearance of small yellow masses in the anterior horns; these horns were destroyed more or less by the exudation into them, and the peculiar degenerate changes in the cells. Dr. Allbutt explained that, as far as he could judge, the vascular changes he had described were not post-mortem conditions.

Danilewsky[1] shows that the alcoholic extract of tetanized muscle contains more nitrogen than that of resting muscle, which, from various considerations, renders it evident that during contraction there is an increased disintegration of the muscular substance. All these observers point to the *disintegration* of tissue in tetanus as an established fact.

From another point of observation I shall now proceed to consider the cause and the effect of this disintegration of tissue in the living body. We turn to chemistry, to physiological chemistry, to the chemistry of muscle, to the chemistry of muscular tetanus; and from this field we appropriate the results of the work of Ranke, the learned Ranke of Munich, as discovered in his brilliant researches. In his masterly work called "*Tetanus a Physiological Study*," his bugle notes reach us with no uncertain meaning. He states that one of the chief problems for physiological investigation has always appeared to be the solution of the question as to the cause by which muscular action is brought about. He commences by giving a brief history of the chemistry of muscular action up to the period when he began his researches. We find that what was once spoken of as a reasonable postu-

[1] Brit. and For. Medico-Chirurg. Review, vol. l., 1872, p. 521.

late is now an existing, demonstrable, commanding fact in physiology.

Previous to this, Magendie had stated frankly that muscular contraction did not differ from the vital processes of which no explanation whatsoever could be given. Liebig then began the chemistry of muscle; he arranged the flesh of mammalia according to the amount of *kreatine* in each, and observed that muscular work appeared to increase the quantity of kreatine in muscle; that the flesh of animals which are in a condition to perform more muscular work in proportion to the bulk of their muscles contains more kreatine; by means of repose the kreatine diminishes; by hunting and running, muscular work, kreatine increases. Muscular contraction is connected with an increase of the kreatine in muscles. There was proof that during tetanus appreciable chemical changes went on in muscle. Here a foundation was gained for assuming that one, through further research in this direction, would possibly find a physiological groundwork for the production of muscle contraction in the forces set free in its disintegration.

Liebig stated that kreatine could only be looked upon as the product of the disintegration of the muscular substance, and Sarokow confirms his statement. It was demonstrable that, during an attack of tetanus, appreciable chemical changes took place in muscular tissue. Du Bois Reymond established the fact that in consequence of tetanus muscular substance becomes acid, and that this acid is *lactic acid*, while in repose the muscular substance has a neutral reaction. Meissner had discovered true sugar in muscle. Helmholtz proved that the relative proportions

of extractive matters in muscle at rest and in tetanus (contraction) are different. In tetanus there is found an increase of alcoholic extractives, and a diminution of the water extractives. Valentin stated that muscle, during tetanus, gives to the atmosphere more carbonic acid than when in a condition of repose. We have here, then, the beginning of the foundation of the chemistry of muscular tetanus.

Ranke here takes up the subject and thus divides his researches—1st. On the influence of tetanus (that is, muscular contraction) on the chemical composition of the muscle; 2d, on the influence of tetanus on the general consumption of material in the living organism; and, 3d, on the chemical arrangements which tend to control muscular action.

I cannot follow in the present paper this learned observer in his researches under these three headings; it is sufficient for my purpose that he makes and proves the following statement in regard to the effects on muscle of lactic acid and kreatine.

The capability which muscle has of exercising its functions depends for its strength upon the presence or absence of certain matters formed in this muscle itself by the *decomposition* of the muscular tissue. Lactic acid and kreatine are the products of decomposition of muscular substance; they are to the muscle exhausting matters; they act in an opposite manner on the peripheral nervous system; they elevate the excitability of the muscular nerves; *they are muscular stimulants.* And so we are brought nearer to the solution of the problem of the proximate cause of the production of muscular contraction.

Muscle, under the influence of the nervous system,

itself produces, by the decomposition of its own substance, matters which cause it to contract. The metamorphoses of matter during tetanus, on which the development of the muscular power depends, take place only within the muscle itself, so that we are constrained to consider the muscle not only as a conducting medium of a force arising without it in the performance of contraction, but also as the substance oxidized and metamorphosed in the production of the contraction. And, lastly, we see that muscular contraction depends on the forces of the muscular substances set free and rendered available by increased metamorphosis of matter, and that the chemical bodies mentioned, lactic acid and kreatine, produce no definitive alteration of the muscle by their presence, but that their effects may be destroyed by their removal. The simple removal of the exhausting stimulating matters, *lactic acid* and *kreatine*, from the muscle, restores the normal vital properties of the muscle.

What, then, are we to learn from these observations and this case of tetanus? We learn this—that tetanus is the result of an augmented disintegration of muscular tissue; that the products of this disintegration, lactic acid and kreatine, further excite the nerve peripheries until by reflex action there is established a "violent and painful contraction of the voluntary muscles, which is long continued and" heretofore "uncontrollable;" that in traumatic tetanus the augmented disintegration of muscular tissue is caused by an increased excitation of the nerve peripheries exposed. That in idiopathic tetanus there is a self-generated power akin to the poison of rabies and to

strychnia, exciting the nerve peripheries, which, by reflex action, causes the augmented disintegration of muscular tissue, and the products of disintegration, lactic acid and keratine, which further excite the nerve peripheries until there is established the condition known as tetanus.

Impressed with this as the pathology of tetanus, the appropriate treatment should be the use of those agents which are known to prevent the disintegration of tissue, which will lessen the irritated nerve peripheries, which will sustain nutrition and advance the elimination of the morbid products.

The agents used in the experience of the past, in the comparatively few cases of success in the treatment of this dreadful malady, would seem to tend to the accomplishment of one or more of these objects: chloroform, opium, nicotine, conia, hydrate of chloral, ice, Calabar bean, and woorara. But all these have failed to fulfil the expectation of their advocates. The rates of mortality are still immense. Of 363 cases of traumatic tetanus recorded in the register[1] as occurring during our war, 336 terminated fatally; of the 27 reported as recovering, 23 were of a chronic form. It is proper to add, that neither nicotine, Calabar bean, nor woorara was used in these cases.

Let us hasten, then, to recommend the virtues of the nitrite of amyl, which I now urgently advocate. Dr. B. W. Richardson, in his paper already alluded to, says, "I believe that, in tetanus, the nitrite might be employed with advantage. Paralyzing the extreme filaments of nerves, and reducing the muscular power

[1] Circular No. 6, S. G. O., 1865, p. 41.

of all the voluntary muscles in the same manner as does woorara, the nitrite possesses advantages over woorara which the man of science will at once recognize." This was written in 1864, eleven years ago. I cannot find that Dr. Richardson has ever used the nitrite in the treatment of tetanus. The two cases of Foster, in 1870 and 1871, and that of Curtis, in 1874, are all I can place my hands on.[1] Richardson, in his paper, states, that "the blood of animals destroyed by the nitrite may always be smelt as charged with the substance." He states, also, that "the fluid, however, in no way interferes with coagulation, but, as I have said before, it arrests oxidation and decomposition." Again, he says: "On the corpuscles it exerts a powerful osmotic action. It has no effect on them in the way of dissolution, nor does it, when added to them, destroy their form or modify the central depression; but it reduces them to half their ordinary size, leaving them well defined and capable of running together in the ordinary and natural way." He says: "The modus operandi of the nitrite appears to be by arresting the process of oxidation in the tissues." Herein consists, in my opinion, its virtues in arresting the progress of tetanus, as notably pointed out in the case which I have recorded.

I take leave to add, on this occasion, that the same

[1] Since this paper went to press I have seen the following notice in *New Remedies, a Quarterly Retrospect*, for April, 1875, edited by F. A. Castle, M.D., New York:—

Funkel (*Deutsches Arch. f. Klin. Med.*) says one case of tetanus, which had resisted the action of all the means hitherto applied, yielded promptly to the inhalation of two drops of nitrite of amyl three times a day. Berlin, 1875.

reasons which prompt me to urge the use of the nitrite of amyl in tetanus, namely, to prevent the disintegration of tissues and to lessen the irritated nerve peripheries while nature is eliminating the morbid product, compel me to strongly advocate the use of the amyl in hydrophobia.

REMARKS

ON

DIABETES INSIPIDUS AND ITS TREATMENT BY ERGOT.

By

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[Read April 7, 1875.]

I BEG to call the attention of the College to-night to diabetes insipidus, and especially to the influence ergot exerts on it, and shall preface my remarks with a case in which this treatment proved successful.

Stephen S——, native of Bavaria, a tailor, was admitted into the men's medical ward of the Pennsylvania Hospital on the 19th of October, 1874. A small, thin man, about 43 years of age, hollow-eyed, with prominent cheek bones, his complaint of weakness and prostration agreed perfectly with his emaciated appearance. Suffering continually from shortness of breath, from indigestion with acid eructations, a burning sensation in the epigastrium, complete anorexia, and from immoderate thirst; having his rest at night broken by the frequent necessity for micturition—he considered but too correctly that his health was lost, and that he was rapidly failing.

No family history could be obtained, and he positively denied any venereal taint. He had always regarded himself as a healthy man until two years ago, when he met with a serious accident. By a fall from the roof of a house he was badly contused, besides sustaining a fracture of his clavicle

and some of his ribs, and hurting the back of his head; for nearly a year after this fall he suffered from headache and vertigo.

I learn from the records of the Hospital that he had been within its walls before he came into my hands. On the 2d of June, 1874, he was received complaining of muscular pains which were considered rheumatic. About two weeks before this he had noticed that he was obliged to urinate more frequently than usual, rising for this purpose two or three times during the night. His urine, judging from the report of its examination the day after admission, was acid in reaction, its specific gravity 1024, and contained no albumen; the sugar test was not applied. He improved under treatment, and was discharged cured of his rheumatism July 27th, 1874; but no note was made of the state of the renal secretion at that time.

For the succeeding months the abnormal frequency of micturition gradually became a more prominent symptom, and one month before his re-admission into the Hospital it underwent a sudden exacerbation.

Conjointly with the troublesome and exhausting flow, the torturing thirst, progressive impairment of hearing, muscæ volitantes principally in the left eye, and shortness of breath, increasing gradually from very slight disturbance to positive dyspnœa, were making his existence a very miserable one. The day after admission (October 20th) the urinary examination gave the following result: The urine in color was very light, almost limpid, slightly acid in reaction, the specific gravity only 1001; it contained neither albumen nor sugar; the quantity in twenty-four hours was 224 fluidounces, corresponding exactly with the amount of water he had drunk.

He was ordered by Dr. Hutchinson, who saw him for a few days, two drachms of infusion of digitalis, and half an ounce of a compound gentian mixture thrice daily; and from this treatment, combined with good diet and rest in bed, he derived marked benefit for the first week. The specific gravity of the urine increased to 1004, and the amount

passed daily was, on the 24th, 160 ounces, and on the 26th only 108 ounces. His general appearance was improved, the appetite was increasing, and he felt so much better that he was allowed to get up and walk about the ward. Unfortunately the improvement was but transitory; for, on the 3d of November, he was passing 252 ounces, of specific gravity 1004, and was obliged to return to bed. The previous prescription was now discontinued, and nitro-muriatic acid, three drops in a drachm of compound tincture of gentian, was given him every four hours; he also took ten drops of deodorized tincture of opium four times daily.

An ophthalmoscopic examination made on the 4th of November showed an apparently normal fundus in the right eye, but the branches of the central artery of the left eye were comparatively diminished in their calibre.

The patient now became very weak indeed, the radial pulse could scarcely be distinguished, and for some days he appeared to be entering a state of what threatened to be fatal collapse. The amount of urine continued to be very large; in truth his condition was more than grave, it appeared hopeless. Quinine, stimulants, large supplies of animal broths were administered, and, on the 7th, the opium, which had been given irregularly during this serious illness, was finally discontinued, as was the acid mixture. He slowly rallied, and when his special treatment was resumed he was placed on a liberal mixed diet, and on the fluid extract of valerian one drachm four times daily. On November 7th, it was noted that he was passing 208, and, on the 8th, 209 ounces of urine, of specific gravity 1006, and very faintly acid.

The specific gravity on the 10th had increased to 1008, and the quantity decreased to 128 ounces; this diminution being, perhaps, in great part attributable to an intercurrent diarrhœa which began on the evening of the 8th, but ceased spontaneously on the 11th of November. At this date he reported himself as feeling much better; he slept well; his appetite was good, and his tongue moist and clean. Two days later the improvement was still evident, the daily ex-

cretion of urine being 146 ounces, of specific gravity 1006, containing—as carefully ascertained by Dr. Longstreth, who made all the volumetric examinations here recorded—16 grammes of urea (247 grains). On the 17th, the urine was found to be of the same specific gravity, slightly acid, and measured 195 ounces. This contained 16.446 grammes of urea (254 grains) and 8.358 grammes of chlorine.

As his general condition had now improved somewhat, I made a searching examination of the viscera and nervous system, hoping to discover the seat of the lesion. But I could find nothing. There existed a slight increase in the area of hepatic dulness; the splenic dulness was normal in extent and situation. No lung or heart lesion could be detected, but the first sound lacked weight and fulness. He complained of supra-orbital headache and partial deafness in the left ear; yet the examinations of the eye and ear gave the same indecisive results as before. The base of the tongue was slightly furred; the remainder of its surface was clean and moist. The pulse was 84; the respiration varied between 18 and 24. The temperature of the body was 97.5°. It had at no time been higher than 99°, and had repeatedly fallen to 97°, with an evening exacerbation of half a degree, or very occasionally of one degree. A half ounce of cod-liver oil thrice daily was added to the treatment.

The next day (November 22d) he passed 168 ounces of urine, specific gravity 1004, but the daily amount rapidly increased until it reached 260 ounces on the 25th, of specific gravity 1006, containing 24.407 grammes of urea (376¾ grains).

The valerian was now stopped, as it had so evidently wholly failed, and ten grains of hydrate of chloral were given four times a day; but, as the dyspnœa seemed to increase, this in turn was abandoned in favor of bromide of potassium twenty grains thrice daily on the 1st of December, at which date he passed 193 ounces of urine containing, as Dr. Longstreth informed us, 25.124 grammes of urea (387 grains) and 5.813 grammes of chlorine.

During the first days of December the face and ankles

became œdematous, the subcutaneous veins of the leg were enlarged, and dark red lines were visible on the lower extremities, which also pitted readily on pressure. He complained still of a great deal of headache and of a feeling of tenseness of the skin on the forehead, and furuncles became manifest on the face. His condition was thus little, if at all, changed for the better. I now determined to give him ergot, a plan of treatment which, in conversation with my colleague, Dr. Hutchinson, I found had suggested itself also to him. At first it was resorted to hypodermically, but this caused so much local disturbance that the remedy had to be administered by the mouth. The internal use was begun on the 7th of December, one drachm of the fluid extract being given three times daily; this was increased December 18th to two drachms thrice daily. The diet was the same as before; the cod-liver oil was continued for a time, but not with great regularity, and it was presently wholly stopped.

From the time that the treatment by ergot was instituted there was steady diminution in the daily amount of the urine, and rapid improvement in the patient's health; indeed this was without a drawback, with the exception of a slight attack of pleurisy followed by some congestion at the base of the lung, and lasting only a few days. The patient was practically well on the 25th of January, 1875, when the ergot was discontinued, but he was retained under observation until March 10th, in order to decide whether the improvement was a permanent one.

The steady decrease in the amount of urine from the use of ergot may be seen from the following: The remedy was fairly begun on the 7th of December, the amount of urine passed in twenty-four hours had been, on December 4th, 227 ounces, which was the last measurement made before the ergot was commenced. On December 9th, it was 152; on the 14th, 126; and on the 23d, 91 ounces. From this time onward the highest amount passed was 76 ounces on December 27th, and from the first of the year to the date of discharge the maximum was 74 ounces, and had been several times as low

as 40 ounces a day. It is proper to state that during his stay in the hospital the urine was repeatedly tested for albumen and sugar, but with uniformly negative results.

When discharged he was well and strong, and he had never been in better health. During his stay with us he gained in weight forty pounds; and it was difficult to recognize, in the fat, bright-eyed, jovial man who left the hospital, the lean, languid-looking, dejected patient who had come to it but a few months before apparently to die.

He was seen last week (April 3d, 1875), and reported his improvement as permanent.

In concluding this report of the case I have placed in tabular form, for ready reference, some of the points it illustrates. But I wish further to make a few remarks on the features of the disorder. The origin in a blow on the head is in accordance with other cases I have met with, for in two more of the number which I have recorded or distinctly recollect, the affection followed unmistakably, and at no very long interval, an injury to the head. There are, of course, further prominent causes to which the strange malady may be traced, and among these, and in a certain sense allied, I have had my attention strongly called to its following sunstroke and cerebro-spinal fever. Then we meet with instances in which it forms a symptom of a coarse lesion of the brain, as of a tumor; or follows violent emotion; or exists, though this is not often the true well-marked disorder, as part of the hysterical constitution; or, again, it is clearly hereditary; or we encounter examples in which the origin of the trouble is not to be made out. But without pretending that what has been mentioned exhausts even the indubitable sources of the disease, it has made apparent how often it is linked

to some nervous disorder, though it may be one which we may not be able always to unravel. But whether the cause be, as seems most probable, in the sympathetic nervous system, or the derangement leading to loss of control be simply reflected to this from the cerebro-spinal, is a matter, with our present knowledge, of the merest conjecture. In a number of the autopsies made—they are not, it must be stated, very numerous—the lesion has been located at the base of the brain, or in the cerebellum or the medulla; but I have found records of the disease in which injury of the abdominal ganglia by a tumor gave rise to the distressing malady.

As regards the symptoms in the case detailed, they are those usually seen. In one respect, however, there is a difference—the urea was not found in the urine in increased quantity. The dropsy I have repeatedly met with, and in one case that came to me from a distance, the worry and exhaustion occasioned by the enormous accumulations appeared to be the immediate cause of death.

Diabetes insipidus is, when well-marked, for the most part a fatal disorder, though the patient may be kept in fair health for years. "The treatment of the disease, so far as our present knowledge goes, is rather compensatory than curative," says the latest authority on the subject; and, notwithstanding the good results published by Trousseau in a few instances from the valerian treatment, he agrees substantially with Dr. Dickinson, for these are his ominous words: "I have, on the other hand, had the pain to see nearly all the polyuric patients whom I had to treat waste away rapidly and die much earlier

than those who had saccharine diabetes." My own experience has been the same; and the case which I have to-night presented to the College is the first one which I have seen recover; I mean the first marked one in which there were the grave symptoms of disturbance besides the excessive flow of urine.

That the recovery was due to the action of the ergot there can be no doubt. The drug has been used in saccharine diabetes, and, it is said, with some advantage, though I have not been able to obtain with it any specially good results. But I do not know that it has before been employed successfully in diabetes insipidus; indeed, when I began to prescribe it, I did not know that it had been suggested. I find, however, casual mention made of it by Roberts and by Niemeyer, the latter stating that, like some other remedies he mentions, it is not based on the results of experience but on theoretical grounds. Indeed, from all the references to it which I have seen, I infer that it has either only been thought of or passingly tried; for I have not met anywhere with a record of its leading to a cure. Its effect on the capillaries, both of the nervous centres and in glandular organs, suggests its mode of action. That the remedy will be available where grave organic lesions exist I do not think, but I indulge in the hope that freely given it will prove of service in cases which without it are incurable.

TABLE SHOWING AMOUNT AND QUALITY OF URINE PASSED, WITH SUMMARY OF TREATMENT.

Date.	Condition of Urine.						Treatment
	Per diem.			Color.	Reaction.	Specific gravity.	
	Amount in ounces.	Urea, grammes.	Chlorine, grammes.				
1874.							
Oct. 20	224	.....	.....	limpid	slightly acid	1001	Inf. digitalis.
24	160	.....	.....	amber	slightly acid	1004	Gentian and iron mixture.
26	108	.....	.....	.....	.....	.....	Nitro-muriatic acid.
Nov. 3	252	.....	.....	.....	slightly acid	1004	Opium.
7	208						
8	209	.....	.....	.....	faintly acid	1006	Fluid ext. valerian.
10	128	.....	.....	very light	.....	1008	
13	146	16.007	.....	.....	faintly acid	1006	
17	195	16.446	8.358	.....	faintly acid	1006	
22	168	.....	.....	.....	.....	1004	Cod-liver oil in addition to valerian.
25	260	24.407	.....	.....	.....	1006	Hydrate chloral in place of valerian.
27	186	.....	.....	.....	.....	1006	
Dec. 1	193	25.124	5.813	.....	.....	1008	Bromide of potassium.
4	227	.....	.....	.....	.....	1010	
							7th. Ergot.
9	152	.....	.....	.....	.....	.....	
14	126	.....	.....	.....	neutral	1010	
							18th. Ergot increased to f℥ij of fld. ext. thrice daily.
23	91	.....	.....	.....	.....	1012	
27	76	.....	.....	.....	.....	1014	
1875.							
Jan. 2	70						
25	67.75	18.742	6.679	.....	.....	.....	Medication discontinued.
Feb. 2	48	.....	.....	.....	slightly acid	1018	
14	74						
19	54						
To Mar. 10	40–70	.....	.....	.....	.....	.....	Discharged cured.

REPORT

ON THE

SURGICAL CONSIDERATIONS

IN REGARD TO THE

PROPRIETY OF AN OPERATION FOR THE SEPARATION OF ENG AND CHANG BUNKER, COMMONLY KNOWN AS THE SIAMESE TWINS.

DEDUCED FROM AN AUTOPSY MADE BY THE COMMISSION APPOINTED BY THE COLLEGE OF PHYSICIANS OF PHILADELPHIA, FEBRUARY, 1874.

By

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[Read May 5, 1875.]

The news of the death of the Siamese Twins, Eng and Chang Bunker, which occurred at the residence of the former at Mount Airy, North Carolina, January 17, 1874, was widely published, and caused much interest and discussion among medical men and the public generally. The twins, about 63 years old at the time of their death, as stated by their families, had, during the greater portion of their lives, supported themselves by exhibiting their curious bond of union, so as ultimately to have accumulated what was to them a handsome competence. To advance their

own interests they frequently consulted medical men in different parts of America and Europe, as to the safety of a surgical operation to divide the band and release them from their peculiar connection; these consultations were mainly used to excite the curiosity of the public, as it is believed by those who knew them well, that they never, except once, seriously contemplated such an operation. Upon this one occasion, after a violent disagreement, they consulted their physician, Dr. Hollingsworth, Sr., of Mount Airy, but, when he stated to them his belief of the uncertainty and danger of the operation, reminding them of the opinions that they had received from many distinguished medical men, they relinquished the idea entirely. This event occurred not very many months prior to their death. In consequence of the interest excited, not only in this country, but abroad, in reference to the propriety of any operation, much curiosity was expressed in the medical centres of our country, on receipt of the telegram announcing the death of the twins, as to what might be the nature of this connecting band, and a hope that a post-mortem examination would be made to investigate its structure, so as to decide whether or not they could have been safely separated, and thus gratify a desire very widely entertained. It was held to be a duty to science and humanity, that the family of the deceased should permit an autopsy. The twins had availed themselves most freely of the services of our profession in both hemispheres, and it was considered by many but as a proper and necessary return, that at their death this *quæstio vexata* (the possibility of a successful section of the band) should be settled by an examination of its

anatomical structure. Conversing upon this subject with several of my medical friends, I became impressed with its importance, and felt that it was the duty of the medical profession of this country to make an effort to elucidate the point at issue.

Day after day passed and no information was received as to whether or not an examination had been made. At the end of a week it was understood that the bodies had been placed in a cool cellar, well protected from external injury, but not preserved by any antiseptic. In conversation with some of my present colleagues of the faculty of the Jefferson Medical College, it was thought advisable to make inquiry at Mount Airy, the home of the twins, distant about 400 miles. With the consent of Prof. S. D. Gross, a senior member of the faculty, I telegraphed to the Mayor of Greensborough (that city being the nearest point of telegraphic connection to Mount Airy), by the aid and through the courtesy of Mr. Wm. S. Stokley, Mayor of this city, and General Henry H. Bingham. I inquired if a post-mortem examination had been made, and, if not, if one would be permitted; offering the use of the anatomical rooms of the Jefferson Medical College for that purpose, and my own services in making an autopsy. Should the family not permit the bodies to be removed, I volunteered to go to Mount Airy to make the examination.

I received a visit in the course of two days from Dr. Hollingsworth, the elder of the two brothers who were the physicians of the twins, and it was decided that I should go at once to Mount Airy to make the examination. At the suggestion of Prof. Joseph Leidy, Dr. W. S. W. Ruschenberger, and Prof. John Neill, I

received as a colleague Prof. Harrison Allen; I also invited Dr. T. H. Andrews to accompany us. It was arranged that Dr. Allen and myself, if successful in obtaining an autopsy, should make our report to the College of Physicians, if the College should deem it worthy of acceptance. We succeeded in inducing the family to trust us with the bodies, under a written agreement which engaged Dr. Allen and myself to return them to such agent or agents as the family should select. This gave us permission to make such a post-mortem examination as would not disfigure the cadavers, and to examine the strange band that united them, on what was called its posterior part, but in no way to deface it in front, nor to divide it asunder.

We commenced the examination at the house of Eng, February 1, 1874. We first injected the bodies with a solution of chloride of zinc, which I took with me, of the ordinary strength that I have been in the habit of using for the preservation of subjects for dissection. We opened the right primitive iliac artery of Eng, and the left one of Chang, injecting the antiseptic fluid upwards and downwards, as the bodies lay before us in their natural or customary recumbent position. Dr. Allen and myself are much indebted to Dr. Andrews for his valuable assistance at Mount Airy, and particularly for his accurate memoranda of the ante-mortem history, as given to us by the Drs. Hollingsworth and the family of the twins. In addition our thanks are due to the Drs. Hollingsworth, and to the legal adviser of the widows Bunker, for the valuable assistance which they rendered us. Without their active co-operation we should have failed in our effort. The autopsy was concluded at the Mütter Museum of

the College of Physicians, where we conveyed the bodies. The College accepted the care of the cadavers; honored the three gentlemen above mentioned who had gone to Mount Airy with a vote of thanks, and appointed Dr. Allen and myself a commission to conduct the examination.

The commission endeavored to make the autopsy carefully and accurately. Its members were associated in the dissection, and together critically examined all its details previous to placing them on record. At a special meeting of the College held February 18, 1874, at which were present many prominent surgeons and physicians, the commission made a verbal report describing the general and surgical anatomy of the structures uniting the bodies, which description is included in this paper.

The complete anatomical description of this human anomaly is interesting and valuable to anatomists, but the general interest of the medical profession is centered in the question whether a being of this duplex development, so closely united as to justify the scientific name of Omphalopagus xiphodidymus, could be separated with safety to life. This name, which I suggested for the anomaly, and which was adopted by the commission at the above-mentioned meeting of the College, is formed in accordance with the nomenclature of double monsters employed by Dr. Fisher, of Sing Sing, New York. In his article on duplex development, he gives of compound monsters, Class I. Double monsters. Order III. Terata anacatadidyma; *Def.* Duplicity with more or less separation of both the cephalic and the caudal extremities of the cerebro-spinal axis existing contemporaneously. Of this order

Genus I. is the Omphalopagus; Species I. Omphalopagus xiphodidymus. As on our dissection we found this specimen of duplex development to be closely united by the diaphragms as well as by the xiphoid cartilages, it might be more accurate to class it as *Omphalopagus diaphragmo-xiphodidymus.* There was also union of the livers and of the peritoneum; but the above name seems sufficiently explicit without requiring further complication.

As far as I can learn, it was the general opinion of our profession, both in Europe and America, that any of the proposed methods of section of the band would have involved great risk to life; that upon moral and even physical considerations, it would have been well if the twins could have been separated; but that, upon such information as could be obtained of the anatomy of the band, it was thought to contain structures of such vital importance that the twins' lives would unquestionably have been endangered from shock and subsequent inflammation. No one observer, I believe, attempted to describe all the structures of this connecting band; but the junction of the sternums could be felt at the top, and the peritoneum lining its cavity was recognized by the projection into it, or hernia, as it was called, of a part of the intestines, probably the colon. This was first noticed in this country, as I am told, when one of the twins was suffering from a cough. It could not be positively determined by an examination what other viscera were in the band, or what were its vascular connections. It was impossible by digital examination, even after death, to recognize the presence of the connecting liver band, or the junction of the diaphragms. This could only be inferred from analogous

cases. Sir James Y. Simpson, upon the last visit of the twins to Edinburgh, examined them with much care. He attempted to illuminate the band by means of a powerful light placed behind it, but it proved too opaque. He tested the vascular connection of the twins by giving a dose of iodide of potassium to Eng, and then after sufficient time examining the urine of each by the starch test for iodine. This gave the characteristic color with the urine of Eng, but no distinct trace with that of Chang; a result which corresponded with the experiment made by Bolton in 1830, who made use of asparagus, giving it first to one and then to the other.[1] The result of this autopsy must, however, in the case of any similar monster, in connection with the autopsies of analogous cases, not only bring to the surgeon's consideration as parts likely to be severed, the peritoneum and cartilages, and some arteries and nerves of lesser importance, but must also suggest the possibility of danger from the presence of the liver, if there be but one doing duty for both bodies, or from some connection between separate livers, and also from the existence of connected or united diaphragms.

As far as I have been able to find opinions expressed in regard to the propriety of an operation, it was not the fear of the vascularity of the band that impressed surgeons with the danger of the procedure, but the known risk of shock and inflammation attendant upon opening or cutting into the peritoneal cavity; and, in addition, the uncertainty as to the constituents of the band, and the fear lest some additional and unforeseen complication might occur in the operation, which would increase the risk already recognized.

[1] British Medical Journal, vol. i. 1869, pp. 139, 232.

The post-mortem examination has revealed that the vascularity of the band would have been no obstacle, and that even the circulation in the tract of union of the livers was slight. The band of hepatic tissue uniting the livers, elongated and narrow, of about the relative size, shown in the diagram (B), would not have proved an obstacle to the section, and the ensiform cartilages could have been easily separated at their articulation. But cutting through the united diaphragms would have made an additional and grave complication, and the shock to the sympathetic nervous system would have been serious. In addition to peritonitis, diaphragmitis might have occurred, with inflammation extending to the pericardium and pleura, and a new disturbance to the heart might thus have been added to the original shock.

The twins were naturally fearful as to the result of an operation, and had become so accustomed to their curious relation as to act and live under certain regulations of their own as one individual. We were told in North Carolina that they had agreed that each should in turn control the action of the other. Thus Eng would for one week be complete master; they would live for that time at Eng's house, and Chang would submit his will and desires completely to those of Eng, and *vice versâ*. Though it seems most immoral and shocking that the two should occupy the same marital couch with the wife of one, yet so thorough was this understanding of alternate mastery, that, as I was told by one of the widows, there never had been any improper relations between the wives and the brothers. This understanding was so positive, that Chang's death, and Eng's following it, were immediately due to

their leaving Chang's house in inclement weather, at the end of the week, to go to Eng's, for his week in return. When Chang was master for the week he would do whatever pleased him, and Eng could only remonstrate or make suggestions. Thus Chang would become intoxicated in spite of his brother, and much to his inconvenience; would break things in his own house, and, upon one occasion, threw a feather bed into the fire, and made himself otherwise disagreeable, in spite of the remonstrances of his brother.

I mention these circumstances to show how they had learned to accommodate themselves to their situation; and probably they regarded themselves as equally, if not more favorably situated in respect to the necessities of life than if they had enjoyed a separate existence. They brought to the accomplishment of any undertaking, if needed, a double strength and a double will. This was recognized in their double life, and after their death the sentiment of the family was such that they were not divided. I have in my possession a print, in which they are shown as engaged in various employments—rowing in a boat, shooting, chopping wood, etc.—and I was told that at Mt. Airy they were in much request among their neighbors in house raisings, as they could lift a corner better than any one or two men. This feeling of unity would have been in my judgment a consideration of some importance in the question of the operation of separation, when they were in their prime and at their best. Of course the revelations made in the autopsy of the atheromatous condition of the arteries, would exclude the idea of any late operation under that condition. In addition to the ordinary physical shock of an operation affecting

such important anatomical structures, the serious mental and moral impression it would have made, even if they had been anxious and willing, would unquestionably have been great. It would have entered seriously into the question by preventing the surgeon from urging an operation if they had been unwilling to submit to it, and should have formed part of its consideration even if they had been willing, and if they had wished to assume all the responsibility.

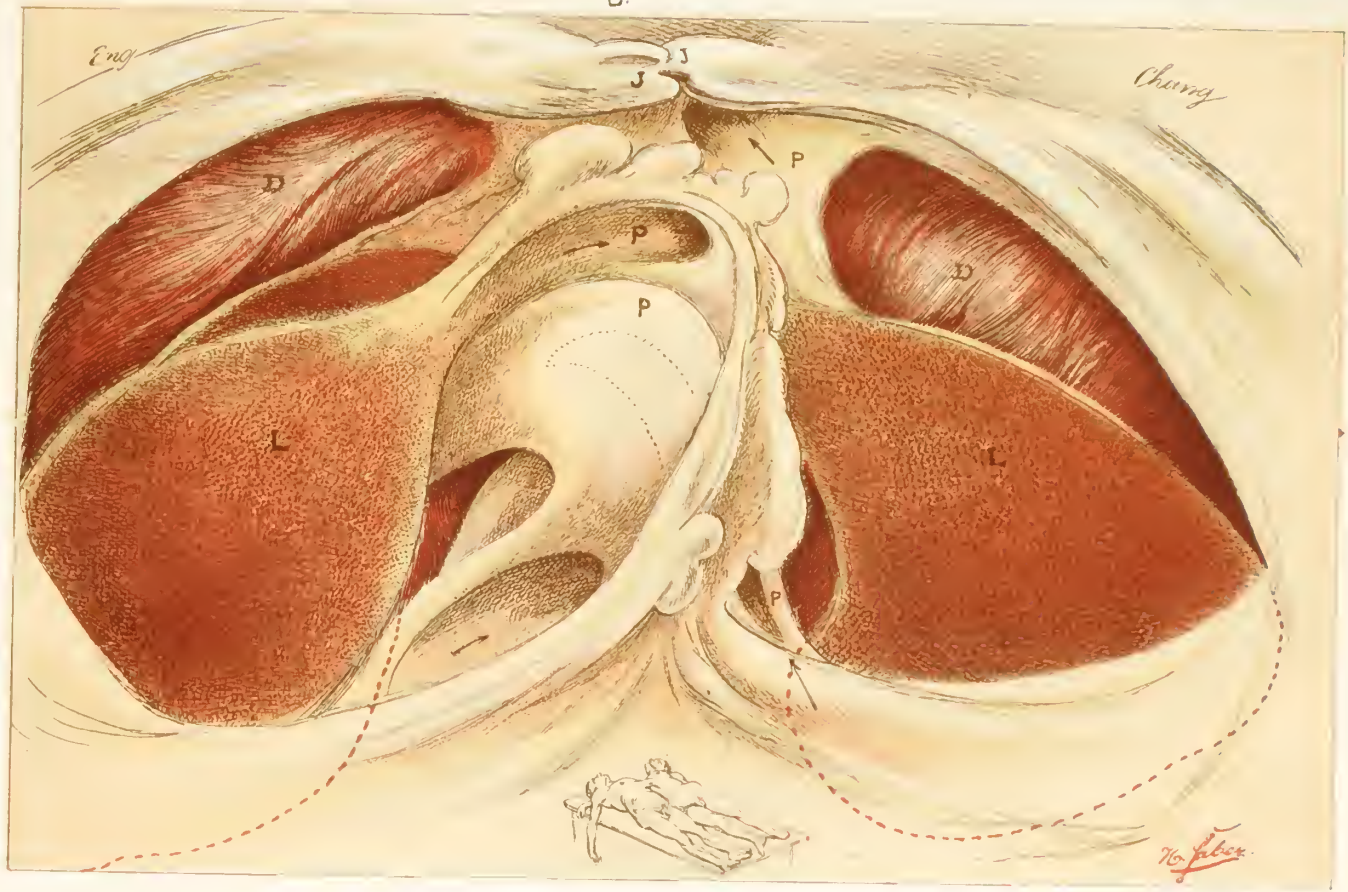
The malformation of the twins' bodies, as the curvature of their spines, and the greater relative strength of their external arms and shoulders (external in the acquired lateral position), so that the right arm and shoulder of Eng and the left of Chang were stronger and larger than those of the opposite sides; and the greater strength and development of their outside legs, which I noticed when I saw them on their last visit to Philadelphia, showed the thorough accommodation of their bodies. This was consequent upon the instinctive, intelligent, and repeated efforts of this duality from early childhood to become a practical unity, so that physically and morally they were practically two in one.

The accompanying lithograph (**A**), while only a diagram, and not anatomically correct, is yet practically so. The accurate and thorough anatomical details are given in the report of my colleague of the commission. By this diagram I aim to show the arrangement of the structures within the band, as well as its surgical anatomy.

At U, on the under surface of the band, is the umbilicus, a large scar; to this went the hypogastric arteries, H, H, and the urachi, Ur, Ur, and from it we traced

E
J
J
E
R
R
B
P
T
T
D
L
L
P
A
Um
Um
U
P
P
H
H
H
H
B
B
M. Faber

B.



the two umbilical veins, Um, Um, in their connection with the livers, L, L. B, B are the respective bladders, and on each side of them are I, I, I, I, the internal iliac arteries. The peritoneums, colored yellow for distinction, P, P, were found in the median line A B of the band as four pouches or processes, separating the peritoneal cavity of one body from that of the other. T represents the tract of hepatic structure, which joined the two livers and lay behind the peritoneum, just under the diaphragm D, colored red. E, E are the ensiform cartilages, joined in the middle line, making an arthrodial joint at J, J. The line representing the lower costal margin of the thorax is shown at R, R.

The second diagram (**B**) shows accurately the arrangement of the peritoneums, P, P, livers, L, L, and diaphragms, D, D. The connecting liver band, being behind the peritoneum, is but faintly shown. The relation of the diaphragms D, D to the ensiform cartilages is clear; the arthrodial articulation of these cartilages is shown, and there is also exhibited the cavity of the articulation at J, J, into which was passed the handle of a scalpel from behind, and which was apparently lined by a synovial membrane covering those parts which were not in contact.

The arrows represent the direction of the pouches of peritoneum. The upper two, marked by the arrows, and called from their position in regard to the liver, the hepatic pouches—one from Chang's side, the other from Eng's—are on nearly the same plane running to the middle of the band. The lower two, running in the same manner, are called in the anatomical description the umbilical pouches of Eng and Chang

respectively. These were so joined, as illustrated in Diagram **A**, that one peritoneal cavity was completely separated by a septum from the other.

In my judgment it is not improbable that the peritoneal cavities were continuous and one in early fœtal life, and that the liver connection was much shorter, and so also the band. In the history of the twins it is related that, in their childhood, they could twist themselves around the band so as to reverse their positions, bringing their heads and feet together, and that they often did so. In these gymnastics it seems to me probable that the continuous peritoneum in the band became twisted, and thus gradually closed so as to form the irregular septum demonstrated in our dissection and shown in Diagram **B**. The very irregularity of the method of forming this septum, or oblique dissepiment of peritoneum, as Sir James Y. Simpson[1] called it, seems to me to support this view, as does also the fact that so many analogous cases are reported, which when examined just after birth showed a continuous peritoneal cavity from one twin to the other. Even if this was not the case, yet the explanation may account for the irregularity of the peritoneal connections.

From a consideration of the anatomical structure of the band, as described and illustrated, I think that the surgeons who refused to operate upon the Siamese twins, in their adult state, were right in their decision. I do not believe it would be judicious to operate by section of the band upon any other such exactly similar adult monstrosity, should it present itself. The experiment of applying a strong ligature around the

[1] Brit. Med. Journ., vol. i. 1869, pp. 139, 232.

band, when the idea was under discussion of cutting through it by the progressive ulceration caused in this way, proved that it could not be done safely, as the pressure of the ligature caused so much sickness and nervous impression that it had to be removed. This, I think, is in proof of the greater dangers which would have been produced by any violent separation. Apart from such experiments, involving the idea of an operation, the twins could easily endure those of a much rougher character. For instance, when returning from Europe, they allowed themselves to be pulled about the deck of the vessel by a rope passed around the band.

We are probably not sufficiently informed as to the condition of the twins in childhood to decide whether an operation would then have been justifiable. But if it ever was to have been performed, then was the proper time, before they had acquired their full mental and physical development. As they are reported, in such history as we have of their infancy, to have been very delicate for the first six months of their life, the operation during that time would have been hazardous. Even after that period, or under the most favorable circumstances, the operation would have been attended with great shock, and uncertainty as to its ultimate success. The removal of a superabundant part is often done when it is relatively but small in comparison with the whole body; even parasitical formations, when they may be large relatively, but only partially developed, and not with perfect nervous connections, may be removed, as in the case of George Washington Lane, operated upon by Prof. J. Pancoast. In that case a partially formed second body,

with hands, feet, and visceral developments, was fastened to the left cheek of the well-formed body, and was growing *pari passu* with it; removal was effected with the *écraseur;* but in giving the child ether I had to stop its use for a few minutes, and the operating surgeon administered stimulus to save the child from dying on the table. The patient is now nearly seventeen years old, and hearty and strong.

There are only two cases on record, that I know of, where the operation has been tried, with any success, upon twins joined at the umbilicus and sternum. That of Dr. Böhm[1] cannot be called a complete success, as one of the children died in three days and a half, and the other was very much prostrated.

The other, and a very famous case, was successfully operated upon by Dr. Fatio, and is also known as the "König case" and the "Zwinger case." I have seen the account, with a plate, in a volume of the Ephemerides Germanicæ, in the library of the College of Physicians.[2] The operation was an ingenious and cautious one, and deserving of being remembered in connection with this problem of surgery. The case seems very analogous to that of the Siamese twins.

"The connecting band[3] is stated to have been formed by a coalition of the xiphoid cartilages, and umbilical vessels, surrounded by areolar tissue, and covered with skin, with a very thick umbilical cord attached to its lower surface. It

[1] Recorded in the Revue de Thérapeutique Médico-Chirurgicale of Aug. 1st, and in Virchow's Archives, 1866, vol. xxxvi., page 152, and by Dr. Robert P. Harris in the American Journal of Medical Sciences, No. cxxxvi., Oct. 1874.

[2] Dr. Emanuel König, Ephemerides Germanicæ, 1690; Dec. ii., An. viii., Obs. 145.

[3] Dr. Theodore Zwinger (Zwingerus), Ibid., 1691, Dec. ii., An. ix., Obs. 134. Translated by Dr. Robert P. Harris, Am. Journ Med. Sci., Oct. 1874.

measured an inch and a half in length, one inch in thickness, and five inches in circumference, which would give a vertical diameter of about two inches. The double funis had been cut and tied by the midwife, at a length of about eight inches, which was found of advantage in the method of operation adopted by the consultation. This was to separate the cord up to its division in the band, tie the vessels to prevent hemorrhage, ligate the band below the cartilaginous link; and when the ligature cut its way out, sever the cartilages by incision."

"It would appear . . . . . that when the children cried the band above the umbilical junction '*appeared thick and swollen.*' . . . . . After the cords were separated and tied, Dr. Fatio perforated the band with needles, and ligated all below the ensiform bridge, using a second ligature of six wires, thrice carried around, to be tied tighter and tighter, until all the included parts were divided. The ligature having fallen off in nine days, the ensiform connection was severed by a bistoury on November 23d, 1689, in the presence of several physicians, surgeons, and distinguished citizens of the town of 'Basil.' The parts healed in ten days, and six months afterwards the twins and mother were reported as in good health."[1]

These are the only two successful cases of operation among the great number of cases of omphalapagous twins reported in two hundred years. Foerster, so commonly quoted, gives us a table of 114 cases, in only one of which was an operation of separation performed.

Through the courtesy of Dr. A. B. Cook, Prof. of Surgery in the Kentucky School of Medicine, Louisville, Ky., I have

[1] Harris, Amer. Journ. of Med. Sciences, Oct. 1874, p. 372.

received his interesting report of an examination of a similar monstrosity. He reports that the anatomical examination revealed the following peculiarities:—

1. The junction of the xiphoid cartilages.
2. Two lineæ albæ.
3. One common diaphragm.
4. One common peritoneum lining a common cavity, and two sets of viscera, with one exception (the liver).
5. One common umbilical vein.
6. One liver, with a double circulation.
7. The curve of the inferior cava of the right fœtus, to the left side of the vertebral column.
8. The radical change in the relations of the venæ cavæ, hepatic veins, and venous ducts, to the posterior border of the liver.
9. The duplication of all the organs, with the exception of the liver.

In this case, owing to there being only one liver common to the twins, and that placed in the band, and a common diaphragm, no section of the band could have been successful.

About ten days ago I was shown at the Philadelphia Hospital by Dr. E. E. Montgomery, one of the Resident Physicians, an omphalopagus, which he had delivered in the obstetrical ward of the hospital, aided by his fellow-residents, Dr. Edwards and Dr. Deaver.

Dr. Montgomery kindly permitted me to see his dissection, and afterwards wrote me a description of the anatomical facts, of which the following is a summary:—

1. The twins, both males, weighed together 10 lbs. 4 oz.; neither showed any sign of life.
2. They were connected at the umbilici by a band three inches in length.
3. At the centre the band was seven inches in circumference,

but constricted where it joined the bodies; it contained a portion of the intestines.

4. The anus in each twin was imperforate.

5. The genitalia were well developed.

6. So also were the lower extremities, except for a talipes equino-varus of the right leg, in the first child.

7. The placenta was large, but presented no separation.

8. The cord, which consisted of two arteries and two veins, came off from the centre of the placenta.

9. The membranes of the first child covered the whole fœtal surface of the placenta, while those of the second arose from the placental end and surface of the cord, and consequently were enveloped by those of the first; the membranes of the second child were apparently a reflexion of those of the first, thus placing the child without, instead of within, the membranes.

10. The umbilical cord became bifurcated three inches from the children, and entering the band had a portion directed to each child.

11. The circulation in the liver was the same.

12. The vein entering the umbilicus took its usual course to the liver.

13. The abdominal aorta in each twin gave off but one hypogastric artery, which passing out at the umbilicus became the umbilical artery.

14. The peritoneal surface was continuous from one twin to the other.

15. The greater portion of the small intestine in each, was in the abdominal cavity, but at about the junction of the ileum with the jejunum of each child, the intestines passed through into the common sac, where they joined to form a triangular union or receptaculum, an inch and a half in length, by an inch in breadth at the base, which was continued by small intestines to the cæcum.

16. The peritoneum of each was so arranged that it supported the large intestine, much in the same manner as the uterus is ordinarily supported. At the cæcal end there was

on either side of the double mesocolon, an appendix vermiformis cæci, one for each child.

17. The common large intestine terminated at the lower portion of the band in a large pouch, which opened by a small slit-like aperture into a sulcus.

18. This sulcus beneath the peritoneal surface extended from the body of one child into that of the other.

19. The urethræ were closed within a quarter of an inch of the meati, and there was no indication of the development of a bladder in either body.

20. Introducing a probe into each ureter, it was found to emerge from the sulcus at either side of the anus.

In this case the sternums and diaphragms were not united, but owing to the presence of the continued or united intestines in the band, these twins could not have been separated with safety.

From a consideration of the operation of Dr. Fatio, I would be induced to believe that an operation in the case of the Siamese twins, when infants, might possibly, and only possibly, have been attended with success; that is with the saving of the life of one, if not of both, of the children, if they had had sufficient strength, or if the surgeon had even waited some months or a year or two, to give them an opportunity of becoming as strong as possible, and before their minds could have comprehended the risks of the operation. Should such a case occur again, I would recommend the operation, and be willing to perform it, even if, as in Dr. Böhm's case, one of the children died, for then at least the survivor would be able to enjoy a natural life. Even if both perished, the risk might be justified; the moral sense of the community, at least in a Christian country, would then not be shocked by the unnatural complication which otherwise would

arise, and did arise in the case of the Siamese twins, proving the cause of so much criticism—a criticism severe and unjust, when we consider the peculiar conditions under which the twins enjoyed their lives, the respectable families which they raised, and the good opinion in which both the Messrs. and Mistresses Bunker were held in their neighborhood.

In regard to the question of separating the dead brother from the living, I think it should have been done, and that it would have been the part of wisdom in Eng, when he found his brother so ill, to have engaged his surgeon to remain continually at his house. It would have given him a chance for his life, and as the section would have been made through the dead parts of the band on Chang's side, the peritoneal cavity of Eng need not have been opened. Of course the result would have been uncertain, but I have the wish that it had been essayed. In the case of the male Armenian twins A.D. 945,[1] united by their abdomens, when one died, the dead one was separated by surgeons from the living, the latter surviving for three days and then also perishing. During the reign of James IV. of Scotland, a double male monster was born in that country, near Glasgow. The twins were brought up and educated by the king, and therefore the character of the monstrosity was well known. They were described by George Buchanan, John Lindsay of Pitscottie, and Drummond of Hawthornden. John Lindsay says that the male twins were two bodies from the navel up, complete in all their members; from the waist down but one person, and joined at the back. They lived

[1] L'Histoire du Bas-Empire par Le Beau, 1776, t. xvi. p. 28. Harris, loc. cit.

to the age of 28 years, one dying several days before the other. As the dead became putrescent, the living wasted away by degrees.[1]

In concluding the surgical consideration of the uniting band of the Siamese twins, I believe that every practical surgeon will coincide in the opinion:—

I. That as a necessary deduction from the anatomical demonstration of its constituent parts, no operation of section of the band, for the purpose of separating the twins in adult life, could have been performed and their lives preserved.

II. That it would have been judicious surgery, upon the death of Chang, to have at once applied a strong ligature around the band, as far as possible from the body of Eng, and then to have cut through the band, between the ligature and the body of Chang.

III. That whether or not the operation would have been successful in the childhood of the twins, is problematical; but that it would have been the part of wisdom and humanity to have made the effort, using all the precautions employed by Dr. Fatio in his case in 1689, with such additional ones as might have been suggested.

Note.—It has been generally believed that the names Eng and Chang were given to the twins to distinguish them by their position; that Eng signified in the Siamese language *right* and Chang *left*. In this sense the names could not have been appropriate at the period of the twins' birth, for the natural position of their bodies was front to front, the band of union running from the chest and abdomen of one to the same parts of the other. Born in this position, and retaining

[1] Sir J. Y. Simpson, British Medical Journal, vol. i., 1869, p. 231.

it for some years, the twins could, as stated in their history, reverse their position at will, and were in the habit of so doing; and it is not likely, therefore, that one should have been called right and the other left. Moreover, as a matter of fact, the words Eng and Chang have not this meaning I have examined in the Astor library, of New York, a copy of the celebrated dictionary of the Siamese language, *Dictionarium linguæ Thai sive Siamiensis*, by Monseigneur J. B. Pallegoix, Bishop of Mallo, etc. Therein are numerous translations of the words Eng and Chang, but in no place do they signify right and left. In the Siamese language, words spelt exactly in the same way may have an entirely different signification according to the accompanying accent. Thus, by a different pronunciation, a word is made to do service for various meanings. Of all the different significations of the words Eng and Chang, those which give for Eng the meaning of "strictly, to tie strongly," and to Chang that of "unsavory, tasteless," seem alone applicable.

This justifies the statement which has been made, that the twins were not originally called Eng and Chang to distinguish them as right and left, but that the names were given them to express their natural characteristics. Eng was ever the stronger and healthier of the two, and of a pleasant disposition; Chang was irritable, and less amiable. With this understanding of their peculiarities, the names seem much more appropriate, and were probably given for this reason.

CASE

OF

ENCYSTED DROPSY OF THE PERITONEUM,

IN WHICH SUPPURATION HAD OCCURRED, AND ABDOMINAL SECTION WAS PERFORMED, WITH RECOVERY.

By

J. EWING MEARS, M.D.,

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[Read June 2, 1875.]

The occurrence of encysted dropsy of the peritoneum is regarded by the authorities, whom I have been led to consult, as so rare a pathological condition and of such interest in its clinical aspects, that I feel warranted in asking the attention of the Fellows of the College to the present case.

On November 10, 1874, I was kindly asked by my friend, Dr. S. Weir Mitchell, to see in consultation with Dr. William Carroll and himself, a patient suffering from an abdominal tumor. Dr. Mitchell had been previously called in consultation by Dr. Carroll, and had advised with him in reference to the medical treatment of the case. At the request of these gentlemen I made a careful examination of the patient, having obtained the following history:—

Mrs. E. L., æt. 40, native of Ireland, married, and has borne six children, the youngest being seven years of age. The patient dates the beginning of her illness from her last

confinement, in which she was informed that the placenta was adherent, and that she suffered severely from post-partum hemorrhage. She was so much prostrated by the loss of blood as to cause much anxiety to her physician and friends in regard to her recovery. She was able, however, to leave her bed after confinement, at the period usual to her—two weeks—and to resume the care of her house. About three months after confinement, she noticed in the right inguinal region a small swelling, which was freely movable, so that it could be pushed about by the finger. For the period of one year the swelling remained quiescent, then it began to enlarge until it attained the size of a large goose egg. At this time pain was felt in the region of the tumor, and it extended gradually over the entire abdominal surface. About one year ago, six years after the appearance of the tumor, the abdomen began to enlarge, and has so continued until this date. Her general health, which had been previously good, began to decline. Menstruation had been regular and proper until a year since, when it became irregular and painful, and the flow was thick and tarry in character.

On making an examination I found the patient much emaciated and debilitated. The heart's action was feeble and intermittent. Orthopnœa was present. The expression of the face was haggard and betokened much suffering. The pain was constant and of the most exhausting character, and the patient expressed herself as suffering from a "great burden." There was no œdema. The abdomen was enlarged to the size of a full term pregnancy. The surface was smooth and regular, and the veins were not enlarged. The abdominal walls were not very tense, but they could not be lifted from the tumor. On percussion, resonance was elicited over the entire surface as far below as the line of the umbilicus; below this line dulness was marked on both sides—especially on the right. Fluctuation was not very distinct, but still perceptible, giving evidence of imprisoned fluid. Change of position did not affect the percussion sounds.

A vaginal examination showed that the uterus was in a

condition of marked ante-version, and fixed in its position. Pressure applied to the tumor through the abdominal walls did not move the uterus, owing to the fixed position of which it was impossible to introduce the sound to a greater depth than one inch. The finger in the vagina could detect a tumor in the pelvic cavity.

As the result of my examination I announced to Drs. Carroll and Mitchell that, owing to the doubtful character of some of the signs presented, I was not positive as to the exact nature of the tumor. It possessed so many of the characteristic signs of a multilocular cyst of the ovary that I was disposed to so regard it, and expressed myself to this effect. I asked that a further examination be permitted before deciding as to operative measures. This request was granted, and three days subsequently I made a more extended examination, the result of which was to render the diagnosis still more obscure. It was evident, however, that something must be done to relieve the patient, who was daily losing strength on account of the great suffering to which she was subjected. Accordingly I advised an operation of exploration, and, if the tumor was found to be of a character to permit its removal without hazarding too greatly the life of the patient, that the operation should be continued, and the tumor removed. This proposition the patient assented to and Drs. Carroll and Mitchell approved.

The patient's condition was improved, so far as it was possible, by tonic treatment, and on November 22, in the presence of Drs. Mitchell, Carroll, Brinton, Keen, Parrish, Jones U. S. Navy, Mann, and Mr. Stedman, medical student, I opened the abdominal cavity, making an incision two inches in length in the linea alba, and midway between the umbilicus and the pubes. On introducing the finger I found adhesions between the tumor and the parietes of the abdomen, which were separated with some difficulty. I enlarged the incision to four inches in order to obtain a more extended view of the tumor. Through this opening I introduced my hand and separated the parietal adhesions,

which were general. On making an examination after the separation I found that the anterior wall of the tumor, above, was in great part formed by the great omentum, covered by a dense layer of lymph, and firmly adherent to the subjacent intestines; its lower edge was rounded and was fastened to the intestines below, forming a smooth junction with them. Below the border of the omentum the intestines were firmly adherent and formed the remaining portion of the anterior wall.

Seeking for the line of attachment between the intestines, I made an opening with my finger and gave exit in this way to over two gallons of fibrinous pus. The adhesions between the intestines were freely broken up and free exit thus given to the contents. Owing to the very firm adhesions between the thickened omentum and the intestines which lay beneath, it was found impossible to separate them. The effort made to accomplish this, detached at one point the peritoneal layer of the bowel. The omentum was extremely vascular, and free hemorrhage occurred on section of it. At one point Monsel's solution and the hot iron failed to control the bleeding, which yielded finally to the application of a carbolized silk ligature, the ends of which were cut off close, when the ligatured portion was returned to the cavity of the abdomen. The parietal peritoneum could not be recognized as such, the entire inner surface of the abdominal wall being covered by a layer of lymph measuring at least one-third of an inch in thickness.

The intestines were fastened together by dense bands of lymph, and their surfaces were also covered by dense layers. On making a section of the omentum the normal fat tissue was found surrounded by layers of lymph one-half of an inch in thickness.

The abdominal cavity was cleansed by soft sponges and the wound closed by five iron-wire sutures, an opening being left at the lower part for the purpose of drainage. The dressing was completed by the application of a compress of cotton-wool and a bandage, and the patient was placed in bed, and

one-third of a grain of morphia given hypodermically. The pulse was 96, and feeble; the skin was cool; vomiting occurred. Towards evening, reaction was fully established, the pulse rising to 118, and the skin becoming hot. The catheter was employed to relieve the bladder, the color and quantity of the urine being normal. A diet of barley-water was ordered. Morphia, in one-third grain doses, was given hypodermically as required.

On the day following the operation, November 23, the condition of the patient was good; vomiting occurred only once; the pulse was 90, and free from intermissions. The patient slept comfortably, and did not complain of pain except in the wound.

On the 24th the pulse rose to 100. During the night the patient had had eight copious, loose evacuations, which had produced much exhaustion. Brandy, beef-tea, and milk were ordered as diet. I removed the dressings, and found the wound in good condition. The lower portion of the wound, which had been left open, had closed. I broke up the union which had taken place and introduced a gum-elastic catheter of large size through the opening, and pushed it gently into the pelvic cavity. To this I attached a glass syringe of the capacity of an ounce, and evacuated by this means over six ounces of fibrinous pus. After removing the pus I washed out the cavity with a very weak solution of carbolic acid, adding for this purpose one ounce of a solution of the strength of one drachm of the acid to six ounces of water, to a pint of tepid water. I injected a syringeful of this solution, and then withdrew it, and continued the operation until the returning fluid was clear. A tent was then placed in the wound in order to keep it open; compresses, moistened with the solution of carbolic acid, were applied to the wound. Some pain was felt by the patient when the catheter was introduced. The carbolic acid solution did not cause pain, unless it was injected in large quantities. Towards evening the pulse rose to 110.

The next day, November 25, the pulse was 104, and

showed signs of weakness; four alvine evacuations had occurred during the night and morning. About six ounces of pus were removed from the pelvic cavity, and the cavity was washed out as before.

November 26. The pulse was 100, and the condition of the patient was good. Five ounces of pus were drawn off and the cavity was syringed.

November 27. The pulse was 98, and fuller; about four ounces and a half of pus were removed. In order to check suppuration I ordered, after consultation with Dr. Carroll, two grains of quinia four times daily, with twenty drops of the tincture of the chloride of iron. The quinia was increased gradually, until she received twelve grains daily. The stomach did not reject the medicine, and digestion was not interfered with.

Three ounces of pus were evacuated on the 28th. The pulse rose to 100, noted after the wound had been dressed. Slight tympanites was observed, and the tongue was dry. Three of the sutures were removed, those from the upper part of the wound; the lower sutures were allowed to remain, in order to support the opening through which the catheter was introduced. Two days later the lower sutures were removed.

From this date until December 10, when she sat up, the patient's condition steadily improved, the pulse declining to 80, and the quantity of pus removed decreasing to about one ounce daily. This quantity gradually decreased until the 21st of December, when none could be drawn out by the syringe and catheter. It was evident that adhesions had formed around the channel through which the catheter passed into the pelvic cavity. The sinus gradually closed, and finally, January 6, 1875, the opening in the abdominal wall healed.

By degrees the patient returned to the cares of her house and family, being able to perform some of the more arduous duties, as ironing, etc. She keeps herself, at my suggestion, upon tonic treatment, although, according to the report, not as faithfully as could be desired. She is entirely free from

pain, and only when very much fatigued does she suffer with pain in her back.

Owing to the thickened omentum and agglutinated condition of the intestines, the abdomen is still prominent, being about one-third the size it was prior to the operation. There is no evidence of the existence of fluid within the cavity.

In connection with this case I venture to suggest for consideration a few points which may be deemed of interest. These relate to the character of the cyst, the question of diagnosis, and the treatment adopted. As to the character of the cysts, they may present different forms. In one, the fluid may be contained in a cyst in front of the intestines, formed anteriorly by the wall of the abdomen, and posteriorly by the omentum and intestines fastened together by adhesions; in another form, the fluid may accumulate and be imprisoned in a cyst behind the intestines, in the cul-de-sac of Douglas, in which the intestines and omentum united by adhesions constitute the anterior wall. In the female, the uterus and broad ligaments might also form a portion of the wall. In still other instances, a pocket or cyst may be formed between the folds of the adherent intestines and gradually be distended by the effused fluids. No matter what the variety of the cyst, its formation is always preceded and produced by peritonitis, which may be either local or general in its character. When we consider the appearances presented in these cases, it would seem evident that the inflammation must of necessity be of the severest character, involving at once the entire serous surfaces. In the case reported, however, the inflammation was, according to the history given by the patient, local, and

of such character as not to detain her in bed beyond the usual period of getting up after confinement.

In quite a large experience in tumors of the abdominal cavity, derived from the practice of Dr. Washington L. Atlee, I have been in many cases interested in observing the existence of extensive inflammatory adhesions, when not the least information relating to an attack of peritonitis could be gained from the patient or her attending physician. The formation of adhesions in certain intances has been ascribed to pressure made by a tumor steadily increasing in size, and the changes which are found are thought to take place without any of the usual symptoms. When we are called upon to treat a case of acute peritonitis, and observe the intensity of the inflammation as manifested by the sufferings of the patient and by the other symptoms presented, we cannot but confess ourselves at a loss to explain in what manner, under other conditions, the products of apparently the same cause may be formed without the most marked symptoms. It would appear that this membrane, at one time so exquisitely sensitive, and so prone to assume rapidly and extensively intense inflammation, may at another time pass through all the stages of inflammation without provoking any symptoms to attract the attention of the patient or to call for medical interference.

When the character of the cyst is considered, the difficulties of the diagnosis in this case can be fully appreciated. The history distinctly pointed to the existence of a tumor originating in the right inguinal region, at first quite small and freely movable under the finger. The physical signs showed unmistakably the presence of a tumor containing fluid. The

absence of resonance on percussion was caused by the thickened overlying omentum, and the thick purulent fluid in the cyst gave rise to quite well-marked fluctuation. Inferiorly, the walls of the cyst were so thickened by plastic deposits as to prevent the determination of its true nature by vaginal examination. The decline in the health of the patient during the last year might have been accounted for by suppuration in an ovarian cyst. It was no doubt caused by suppuration in the false cyst.

The question as to the proper treatment to be adopted in these cases is one of importance. The question relates rather to the method in which the proper treatment should be carried out, as I cannot conceive of any treatment leading to a successful result other than that which should promptly give exit to the purulent fluid, and prevent its accumulation. This may be accomplished by tapping, or by incision as practised in this case. In those forms of encysted dropsy in which the fluid lies in front of the intestines, evacuation with the trocar can be obtained without danger. Where the cyst lies behind the intestines, tapping through the abdominal walls would involve the great danger of puncturing the intestines which compose in part the walls of the cyst. The question of the means to be employed in the after-treatment should, it seems to me, guide in the selection of the operation. The opening made by the trocar, large or small, does not give the free exit to the pus which is desirable, nor does it permit the free washing of the cavity so essential in interfering with the suppurative action.

As in empyema we are advised to make a free incision in order to accomplish evacuation of pus, so in

these cases does it seem proper to perform the same operation, and to apply directly to the parts such remedies as will change the character of the surfaces involved.

Drainage of the abdominal cavity after ovariotomy has been practised of late years with most decided success, and various methods have been employed to effect it. It has been accomplished by making an opening into the vagina through Douglas's cul-de-sac, and through this carrying either a tent or a drainage tube. The tent and drainage tube have also been introduced into the cavity through the lower part of the abdominal wound. It seems to me that it could be effectually done by a properly constructed tube with a syringe attached, as an improvement on the means employed in this case.

Of the great importance of drainage after ovariotomy, in cases in which extensive adhesions have been separated, there can be no question.

[After the reading of the preceding paper, Dr. WILLIAM PEPPER said—]

Cases which may strictly be called encysted dropsy of the abdomen, though rare, are occasionally met with, either as a result of localized subacute peritonitis, or from the pseudo-cystic transformation undergone by large intra-peritoneal clots of blood. In such cases the seat of the fluid collection varies much. It may be within the fold of the great omentum, or in any segment of the abdominal cavity, being bounded partly by the surface of the adjacent viscera, and partly by the new formed wall of lymph or fibrin. In several of the cases which I have observed the cause of the attack has been a traumatic one. In one instance, a lad fifteen or sixteen years of age was knocked down by a car. Soon afterwards enlargement of the right side of the abdomen was noticed; and when he first came under observation there was a circumscribed mass occupying the right portion of the abdomen, which was greatly enlarged. There was distinct fluctuation on palpation. No diminution followed active sorbefacient treatment. A small trocar was introduced, and a considerable quantity of clear serum, and toward the close of the flow some grumous, bloody fluid, escaped. The fluid partially reaccumulated, and the patient was again tapped, when a smaller amount of clear serum escaped, after which the enlargement did not return to any extent, and the mass remained, when the patient passed from under observation, as a doughy inelastic lump about the size of a double fist. It would seem that in this case a large clot of blood had been effused, and that, after the formation of a pseudo-cystic cavity by coagulation of the fibrin on the exterior, a slow transformation of the central parts of the clot, with serous accumulation, had occurred.

In a second case, a young boy was struck above the umbilicus. When first seen, some months afterwards, a circumscribed fluctuating mass could be detected, extending from above the umbilicus nearly up to the xiphoid cartilage. There was also circumscribed dulness on percussion. There were no evidences of suppuration. The collection was evidently not in the abdominal walls, but from its position and circumscribed character, seemed as though it might be in the fold of the greater omentum. Exploratory

puncture was not permitted; and the patient, after improving under a prolonged course of iodide of potassium, and repeated blistering, passed from under observation.

In a third case, a young carpenter was injured in the left side by a falling beam. In less than a month very great distension of the abdomen had appeared (the enlargement having begun on the left side, according to the patient's statement), and resisted internal treatment, so that paracentesis was subsequently performed, and over two gallons of clear serum were drawn off. When he came under my observation there was a considerable return of effusion, distinctly circumscribed in the left half of the abdomen; and there was also a coarse, creaking, peritoneal friction sound and fremitus on deep respiration, over the upper and right limits of the effusion. Continued purgation with elaterium caused quite rapid reduction in the amount of fluid.

In these cases the serous character of the fluid was probable enough. The fact that the effusion was circumscribed by false membranes, or in some of the normal folds of the peritoneum, was clearly demonstrated by the dulness on percussion, which did not vary with alterations in the position of the patient's body; and in two of the cases by the ability to limit the collection by careful palpation. It is seen, also, that while the fluid remains serous in character, it is amenable to the usual treatment for localized serous effusions. In the much more rare cases of circumscribed collections of pus in the peritoneal cavity, such as the extremely interesting one related by Dr. Mears, a different method of treatment is indicated—one looking to the free evacuation of the pus, and the drainage and cleansing of the cavity of the abscess until its walls are approximated

QUINIA AS A STIMULANT TO THE PREGNANT UTERUS.

By

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[Read Dec. 2, 1874.]

The active discussion carried on for several years past as to the effect of quinia upon the gravid uterus, and especially the diversity of opinion among observers, make it desirable to bring forward any facts which may tend to place the remedy in its proper position in the materia medica of obstetrics. Having for several years, and more carefully during the last few months, noticed the action of quinia during the various periods of pregnancy and parturition, and having been enabled to draw some practical conclusions of no little value to myself, I have thought that, perhaps, a brief statement of my results might be of interest to the College.

I. As to its effects upon the uterus in a quiescent state, I have, of course, only been able to make observations incidentally, giving it for the treatment of constitutional affections arising in pregnant women. But I think the experience under such circumstances is quite sufficient to establish the fact that quinia has no power in itself to excite uterine contractions. Since the subject has first been agitated, I have at many

[1] [This paper was not placed in the hands of the Committee of Publication in time to be inserted in its proper place.]

times had under care pregnant women, with diseases of malarial origin, to whom I have administered quinia sulphate in doses varying from twelve to twenty grains in the twenty-four hours, without the slightest manifestation of any disturbance of the uterus; still further, I have had cases in which with symptoms of malarial poisoning, the pregnant uterus had already become disturbed, where there were pelvic distress, tenesmus, and sacro-lumbar pain of a paroxysmal character, and where I have administered quinia in large doses, as before mentioned, with the happy result of relieving the constitutional symptoms, and at the same time of quieting the local pains. The cases could be given in detail, if time allowed; but having no points of interest, except the single facts already mentioned, it would be useless to occupy the time of the College with them.

II. As to the effect of quinia upon contractions of the uterus developed prematurely, from accidental causes, in abortions or early deliveries, my observations have been too limited to establish any positive results; but in five cases I have administered fifteen grains of the sulphate, after the process had advanced beyond the possibility of arrest, and the pains were recurring with regularity, and in none of these instances did I observe any increase in the frequency or efficiency of the contractions, or when there was hemorrhage, any lessening of the flow.

These observations, so far as they go, would forbid our placing quinia in the same rank with ergot, as an excito-motor stimulant with specific effect upon the uterine muscular fibre; for we know from the experience of all observers, that ergot will not only increase

the expulsive efforts of the womb when already excited, in any period of pregnancy, and in the *early* stages of hemorrhagic abortion diminish the flow of blood by causing a condensation of the uterine fibre, and a partial closure of the open vessels from which the placenta has been detached; but that it will also throw the uterus into active contraction from a state of entire rest. In a case under my care recently, when I found it necessary to bring on labor for the expulsion of a dead fœtus, I failed to arouse the uterus to action by any of the ordinary methods in use, until I began the regular administration of ergot in full doses, when a prompt effect ensued.

III. When the uterus is in normal labor at full period of gestation, then we have quinia playing its legitimate part as an aid to parturition; and it is with special reference to its use under these conditions that I have brought the subject to your attention. For a number of years I have been in the habit of using quinia occasionally in cases of marked inertia during the stage of dilatation, in combination with other remedies, such as the administration of diffusible stimulants or hot drinks, abdominal friction, or any other means that might suggest itself in preference to the use of ergot, which, with its dangerous influences upon the child and its occasional fearful risk to the mother, and with its annoying uncertainty of action, I have long since proscribed, or at least limited in its use, during the first and second stages of labor, to rarely exceptional cases.

But for a few months past, I have been experimenting with sulphate of quinia as a promotor of normal labor from the onset of the process, and the observa-

tions, although made in a limited number of cases, show a uniformity of results which I think does not admit of the supposition of a mere coincidence. Since I began the use of the quinia, I have had under care forty-three patients of my own, besides others whom I have seen in consultation, and the experiments have been made upon forty-one of my own, and one of those to whom I was called; of the other two cases of my own, one was a case of placenta prævia allowing no delay for experiments, while the other was completed and the uterus in a state of firm contraction upon the placenta before I reached the patient; all of the cases to which I was called in consultation, except the one mentioned, were cases requiring forceps or other mechanical interference, in which I had nothing to do with the case before or after such aid was rendered. I mention these points to show that the forty-two cases upon which my conclusions are based were not selected, but were in the ordinary run of every-day practice. To each one of these I administered at my first visit after actual labor-pains had begun, fifteen grains of sulphate of quinia, in one dose. In every case I observed within fifteen minutes a decided increase in the frequency and vigor of the contractions, a rapid progress of the labor, and where there was no obstruction, a speedy termination. In ten of the cases there were delays arising from malposition, from deficiency in size of the pelvis, or from disproportion of the head, requiring manipulation or instrumental aid, and all of them necessarily involving tedious dilatation. The remaining thirty-two were terminated with surprising and gratifying rapidity.

Without wishing to prolong the subject by citing

the details of cases, more interesting to the observer than to others, I may mention a few typical examples.

One lady, whom I saw at the request of a professional friend, was a primipara, 26 years old; had been in labor since two o'clock in the night; I saw her at twelve, noon; pains at long intervals and feeble; os only slightly patulous; no decided dilatation; strength becoming exhausted; the patient was nervous and anxious. I advised the use of sulphate of quinia, fifteen grains. A few minutes after its administration a hard pain came on, followed in rapid succession by others; the os began to dilate, and in half an hour the membranes ruptured, the head coming down upon the perineum in a few more pains, and just before one o'clock, less than an hour after I had first seen the patient, the child was born. The uterus contracted firmly upon the placenta, which was removed by pressure and traction; no relaxation of the uterus or hemorrhage more than a proper amount occurred.

A patient with her sixth child, who had had long and tedious labors previously, followed always by profuse flow, and in her last by violent flooding, had been three hours in slight pain when I first reached her; the os was just patulous, soft, and flaccid, the pains making no impression in dilatation; administered the same dose of quinia as above. In a few minutes the uterus was roused into active contractions, and in half an hour the labor was completed. There was no delay in the delivery of the placenta; no disposition to hemorrhage; on the contrary, the flow very moderate.

Another, with whom in two previous labors I had used forceps to combat the effects of inertia, had been ten hours in slow labor when I reached her; the os had but just begun to dilate; the head being forced but slightly against the rim of the cervix by the contractions. I immediately administered the full dose of quinia; the pains began in fifteen minutes to increase in frequency and intensity, and in

a little over an hour the fœtus was expelled without any instrumental aid.

Other cases equally striking might be given in detail, but it would unnecessarily occupy space.

The conclusions that I have arrived at in regard to the action of the drug in these cases are as follows:—

It increases the activity of the normal uterine contractions; the pains becoming more frequent and more intense, the expulsive power being greater, while the yielding of the circular fibres of the os is more prompt; the contractions maintaining their proper intermittent character, the relaxation and rest in the interval being complete; showing in this respect an entirely different action from the continuous spasmodic contraction caused by ergot. The efficiency of the contraction may be judged of from the fact that in the thirty-two cases having no obstruction, although many were primiparæ, and a larger than usual proportion occipito-posterior positions, the average duration of active labor after the quinia was administered was about one hour. In a considerable number of the cases included, I had in several previous labors required to use forceps to combat inertia in the second stage.

It promotes permanent tonic contraction of the uterus, after the expulsion of the placenta. Several of the patients had had flooding under my care previously, some of them habitually, and some stated that they had always had a profuse and weakening flow in all their other labors. In the whole forty-two I had not one case of flooding, and as a rule the uterus contracted firmly after the second stage was completed, and showed no tendency to relax afterward.

It diminishes the lochial discharge to a normal standard; many of the patients expressed surprise at the small amount of flow during the twenty-four hours following labor.

Its use is followed by less after-pains than usual in a majority of cases.

It reduces the frequency of the mother's pulse, and relieves the nervous demoralization so often seen in the first stage of labor.

Given during parturition, it never disturbs the brain or causes its usual unpleasant effects, even in patients who at other times are very susceptible to its influence. Although the dose has been uniformly fifteen grains, in only one case was the slightest sensation of cinchonism manifest, and that lasting only a moment, in a lady who knew what she had taken and was perhaps quite prepared to feel it.

Finally, I would sum up the conclusions I have adopted, perhaps hastily, though with a certain conviction of their correctness; viz.—

I. That quinia has no inherent property of stimulating the gravid uterus to contraction; being inert as to any effect upon the womb in a quiescent state, and having no decided action in accidental labors at any period of gestation.

II. That to its property as a general stimulant and promotor of vital energy and functional activity, and to that alone, is due its influence upon the uterus in normal parturition; producing then no action peculiar to itself, but merely increasing the power of the uterus to expel its contents by its own natural method, converting what is a defective or even pathological action into a simple physiological process.

III. That by availing ourselves of this power, we may by administering full doses of the sulphate of quinia at the onset of labor favor the rapid and safe termination of what might otherwise be a tedious and exhausting work.

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